SOME FACTORS AFFECTING AGRICULTURAL PRODUCTION AND PRODUCTIVITY IN IRAQ INCLUDING SELECTED CLIMATE VARIABLES AND CROPS

By

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TO MY WIFE AND PARENTS

ABSTRACT

In this study of factors affecting Iraqi agricultural production and productivity, it has been found essential to deal both with socio-economic and technical factors on the one hand and environmental conditons on the other.

The ultimate objective of this study is to assess the impact of selected climatic factors on the production and productivity of some principal crops. Such assessment, however, cannot be achieved in isolation from the influence of the socio-economic and technical factors. Considerable variability over time of the latter factors, caused by specific institutional changes such as the land reform of 1958, resulted in changes in agricultural conditions as a whole. Therefore, in Chapters Two to Nine are examined the national and regional conditions of Iraqi agriculture during the 1950-1975 period, i.e. planning and investment, land utilization, land tenure system and land reform, agricultural cooperatives and other organizations, new input factors including farm machinery and, finally, water resources and irrigation methods.

The inescapable conclusion of this section of the study is that there were no significant medium or long-term improvement trends in the yields of principal crops despite varying but considerable additional inputs and planning attention. Moreover, the controls exerted by climate and weather appear crucial factors in both the irrigated and rainfed area. In Chapters Ten and Eleven we therefore turn to a direct examination of climatic and weather factors.

In Chapters Twelve and Thirteen a study is made of the relationship between selected weather variables, i.e. rainfall, temperature and relative humidity, and wheat and barley yield. These two crops were chosen because of their importance to Iraqi agriculture as a whole, and in particular to the rainfed area of northern Iraq where environmental

modifications by man are least strong.

The first point appearing from this analysis shows that yields of these two crops are significantly affected by climatic and weather factors during specific periods within the growing season. The significance of statistical correlations between yields and certain critical climatic factors appear sufficiently valid for crop forecasting with a certain degree of accuracy. As a by-product of this analysis, it appears that there was a significant dislocation period following the implementation of land reform measures.

In conclusion, it is clear that agricultural production and productivity must be dealt with in the context of a whole set of factors, socio-economic, technical and environmental, if significant developments in agriculture and rural welfare are to be achieved.

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CONTENTS

Page

Page

SECTION FOUR

Page

SECTION FIVE

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

SECTION ONE

CHAPTER ONE

INTRODUCTION

It is already agreed by many Iraqi as well as foreign economists that Iraq, unlike many developing countries has an unusually favourable economic potential.[1,2,3] The reasons for this can be summarized as follows. Firstly, Iraq has a low population density, 28 persons per sq. km. in 1977, set against some 48 million donums (12 million hectare, or 30 million acres) of cultivable land.[4,5] One third of the cultivable land is located in the rainfed area of the northern part of the country (see Chapter four). This means that Iraq has a per capita potentiality of cultivable land of about 4 donums (1 hectare, or 2.6 acres), compared with half an acre in Asian countries, or one-third of an acre in Egypt.[6,7] Secondly, Iraq appears to have reasonably available water resources in the Euphrates and Tigris rivers. With proper water and farming management, it appears as if cultivation could be expanded beyond the existing level. Thirdly, revenue from oil exploitation provides ample foreign exchange for technological imports and also provides a considerable control of capital availability for economic development.

Against this background, Iraq started its formal economic development programmes in 1950 when the Development Board was established. Iraq, like many developing countries in attempting to bring a better standard of living to its people, has felt that industrialization is the key factor in the process of economic development.[8,9] In spite of this commitment nothing significant was invested in industry in the early stages, especially, before 1958.[10,11,12] The proportion of total government investment actually made in industry was merely 13 per cent between 1951 and 1959, compared with 30 per cent in agriculture. Most of this latter investment went to large engineering projects to control floods of the two rivers, and to extending the cultivated area.(13) The Development Board was abolished in 1958 and the Ministry of Planning and the Planning Council established. From 1958 onwards the orientation of economic development was firmly towards industrial development. In fact, the actual development expenditure in agriculture increased between 1959 and 1975, though agriculture's proportion of total expenditure dropped from 30 per cent to only 16 per cent in 1975. Meanwhile, the industrial sector's share of the actual expenditure increased from 13 per cent between 1951 and 1960 to 46 per cent in 1975.

After the 1958 revolution, the government introduced many institutional changes to agriculture. These changes included land reform, the establishment of agricultural cooperatives, and the encouragement of a socialist (public) sector by establishing state and collective farms. Also, during this period the government gradually took over control of supply of most agricultural inputs, such as fertilizers, high yield variety seeds, farm machinery and other inputs. At the same time, the government increased its control of markets in major agricultural products, for example wheat, rice, cotton, tobacco and other products.(14) In other words, the government committed itself to the responsibility of managing and developing the agricultural sector.

In spite of this, development policy in the agricultural sector has not been successful. The proportion of the GDP contributed by the agricultural sector declined from 23 per cent in 1952 to nearly 7.5 per cent in 1975 and, whilst this was partly a result of very rapid changes in the oil sector and to a lesser extent in industry, it also suggests that there have been shortcomings within agriculture. This failure becomes clear if the contribution of agriculture to foreign trade is considered. The food import bill increased from I.D. 7.73 million in

1950 to I.D. 157.1 million in 1977, and estimates show it has become higher in more recent years. Increasing imported food cannot simply be explained by a normal increase in per-capita food consumption, but also by the stagnation of the agricultural sector itself.[15] It seems that Iraq shares a failure to increase food production with many developing countries.[16] Table 1.1 shows the shortage of main agricultural products in some Middle-East countries in 1975.

The main general failure to increase per-capita agricultural production or agricultural productivity may be related to several problems. As M.F. Millikan and D. Hapgood put it "agriculture is a 'system problem'. It will perform effectively not if one or two or even several requirements are met, but only if a whole range of inter-acting conditions is satisfied."[17] It is clear from this statement that not only are socio-economic factors responsible for apparent difficulties of agricultural development, but also that physical environmental conditions, such as weather and climate are also responsible. In addition, in agriculture unlike industry, production is normally carried out in a large number of individual enterprises distributed over a large area with a great range of weather and climate conditions.

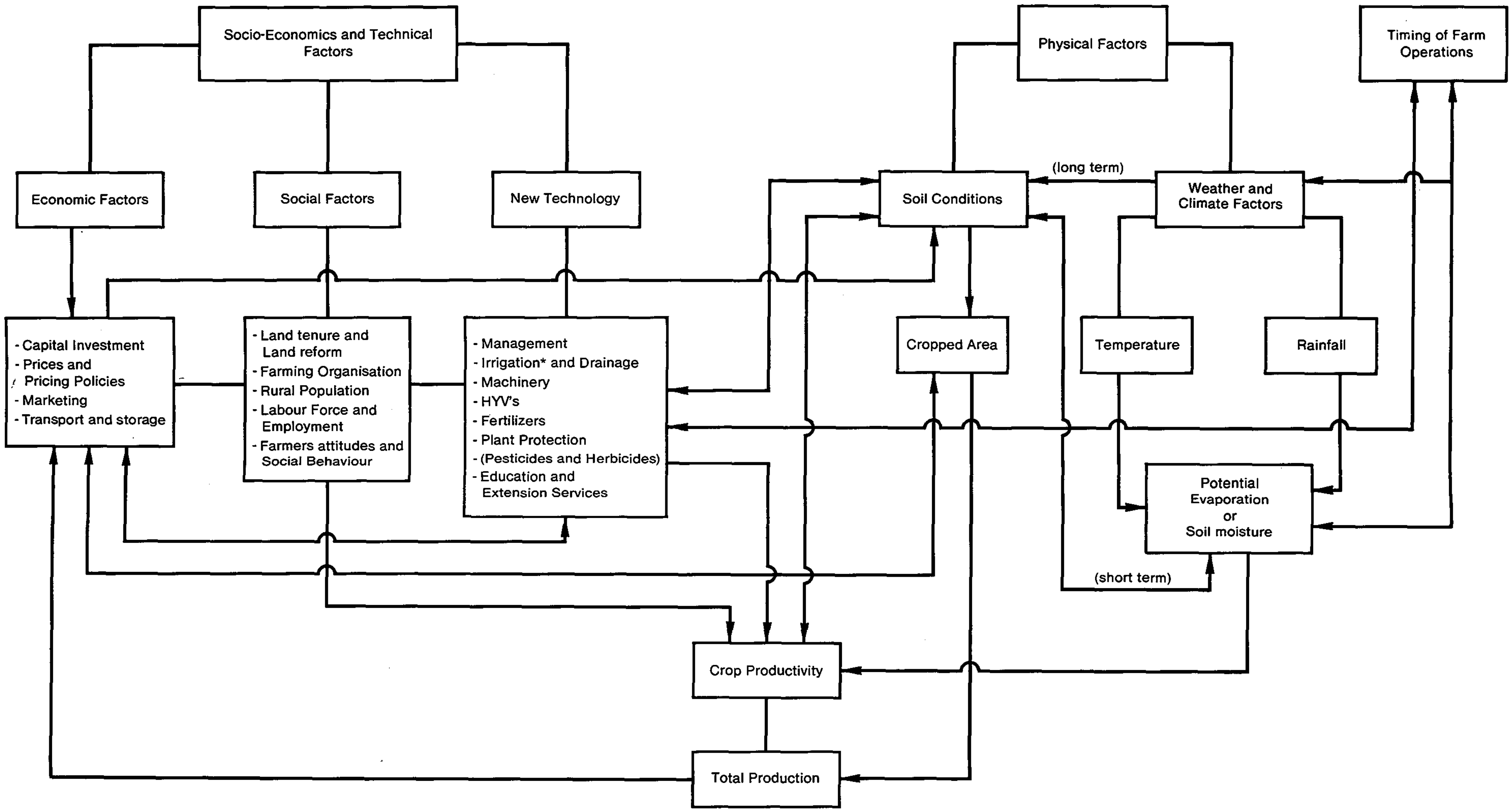
Since there is an extraordinarily high degree of interdependence and interaction between all factors affecting agriculture, any sort of classification of these factors will have a certain degree of arbitrariness, but Fig. 1.1 is used to illustrate at least this interaction of major factors affecting agriculture. It is clear that factors affecting agricultural production and productivity may be grouped into two major categories. The first category include as main elements weather and soil conditions. The second category includes socio-economic and technical factors, and can be sub-divided into three

Table 1.1 Distribution of Producing Countries by Size of 1975 Food Deficits
(Expressed as per cent of total consumption)

% Surplus or Deficit / Commodity	Surplus	less than 15%	16 - 30%	31 - 45%	46 - 60%	60 - 80%	> 80%
Wheat		Syrian A.R. Iraq			Jordan	Yemen A.R. Yemen P.D.R.	Lebanon
Rice				Iraq			Jordan Lebanon Syrian A.R. Yemen A.R. Yemen P.D.R.
Sugar						Lebanon	Iraq Jordan Syrian A.R. Yemen A.R. Yemen P.D.R.
Vegetable oil	Syrian A.R.		Yemen A.R.	Yemen P.D.R.	Lebanon	Jordan	Iraq
Red Meat	Syrian A.R.	Iraq Yemen A.R.			Yemen P.D.R. Jordan	Lebanon	

Source : El-Sherbini, A.A. (1979) : Food Security Issues : The Arab Near-East, Pergamon Press, UK., Table 2,p.3.

Fig 1·1 Factors Affecting Agricultural Productivity and Agricultural Production



*Irrigation is supplementary in rainfed areas major groups. Economic factors include capital investment, price and pricing policies, marketing, transport and storage facilities. The social factors include land tenure system and land reform, farming organization, rural population, labour force, farmers' attitudes and social behaviour. The third group, technology, includes management, high yield variety seeds, fertilizers, machinery, education and extension services, irrigation and drainage facilities and crop protection.

Other models covering the factors affecting agricultural production and productivity may be presented, for example, by the U.S. National Academy of Science, or by M.F. Millikan and D. Hapgood who have indicated weather and climate as crucial factors affecting agricultural production and productivity. [18,19]

Let us now turn to the question of the importance of agricultural development. A decade ago many economists believed that the key to development was industrialization, though more recently economists have become aware of the importance of agriculture in economic development. [20,21] Changes in attitude have come for several reasons. We have already noted that many developing countries are increasingly unable to feed themselves in spite of some improvement in agricultural productivity. This situation has arisen for many reasons, firstly, the population explosion in developing countries, and secondly, a relative increase in per-capita income, the latter leading to an increase in demand for food in low income countries (Engel's Law). [22,23] Thirdly, many developing countries tend to increase agricultural products for industrial purposes, such as cotton and jute rather than food products. Fourthly, the rapid degree of urbanization has increased the number of urban consumers that have to be supplied by agriculture. Fifthly, the disappearance of regular agricultural food surpluses, mainly of grain in producing countries such as the U.S.A. as a result of changing weather conditions since 1973, has led many to believe that world food reserves are now sufficient to compensate for no more than a single year's bad harvest.[24] This doubt has led to the fear that many developing countries may face the risk of famine, or else may have to pay very dearly for imported agricultural products - if they have the foreign exchange. Luckily, most of the Middle-East countries, including Iraq are not at the moment short of foreign exchange. Sixthly, the shortage of energy and other raw materials needed for agricultural production, such as oil and potash, could encourage the major producing countries to reduce their agricultural production, or at least concentrate on domestic self-sufficiency. In future, food will be a strategic product as is oil today. In fact, the pressure is already being felt, and food is now being used as a strategic commodity in trading with developing countries.[25,26,27,28] In addition, there are many classical reasons for the need of agricultural development all based on raising rural living standards, this necessitating an increase in agricultural productivity.

1.1 The Objectives of This Study

Having summarily established the main factors affecting agricultural production and productivity, and the need for agricultural development, the objectives of this study can be summarized as follows:-

- Analysing the factors affecting agricultural production and productivity in Iraq including weather and climate.
- Reviewing weather and climate conditions in Iraq.
- Establishing the effect of certain weather and climate conditions on certain essential crops in key areas.
- Evaluating the potential benefits to the farming system by using crop-weather correlations.

- The possibility of forecasting yields of certain crops by using meteorological data.
- The possibility of incorporating our findings relating to the influence of climate and weather on crop production in measures which could increase production and productivity, this in the context of the other influential factors.

1.2 Methodology

This study will be approached first by examining the effect of socio-economic and technical factors on agricultural production and productivity in Iraq within the period between 1949/50 and 1975/76. Within this period we can identify a first sub-period between 1949/50 and 1957/58, and a second sub period between 1958/59 and 1975/76. We then proceed to investigate the effect of weather and climate on agriculture.

Although weather and climate affect livestock directly and indirectly, as well as food crop production and productivity, this investigation will be concerned only with certain food crops. These also are affected by weather conditions directly and indirectly; directly through the effect of certain weather factors, such as precipitation, temperature, wind, etc., on plants themselves and consequently on the yield of that particular crop; indirectly, pests and diseases are also to a considerable extent associated with certain specific weather conditions. In this study we will be particularly concerned with annual yield fluctuation.

Whilst the effect of weather and climate on agriculture in Iraq as a whole needs to be considered, as do socio-economic and technical factors as a background context, our detailed analysis of the weather-crop interaction is here restricted to the rainfed area of Northern Iraq.

The reasons for this are; firstly, the soil is less affected by or is more free from salinity in the rainfed areas than in the irrigated areas. Hence we can safely assume that the main factors affecting the y ield of field crops are weather conditions and farming practice. These conditions cannot be met in the irrigated areas of Central and Southern Iraq where salinity is a major problem, and where it is impossible to isolate the effect of weather on agriculture from other factors without micro field studies. Secondly, cultivation in the rainfed area is entirely dependent on precipitation in winter and direct climate/weather influence on production is relatively unobscured by irrigation and other environmental modifications.

Two crops have been chosen for detailed analysis in this study, wheat and barley. Wheat plays a very important, sometimes staple, part in the diet of Iraqi people, whilst barley is of key importance as animal feed. Therefore, government policy for a long time aimed at self-sufficiency in wheat and barley production; the rainfed area of northern Iraq produces as a proportion of national production 50 per cent of wheat and 30 per cent of barley. Any fluctuation in the production of these winter grown crops as a result of w eather conditions will have a significant effect on the demand for and supply of these two crops in the whole country.

As noted in this thesis's objectives, weather-crop relationships must be established before any major improvement can be planned for in the farming system. Furthermore, this relationship can also be used to make early forecasts for wheat and barley yield, such forecasts providing the government with useful information which could be used in short term policies, for example, to secure wheat and barley supplies for the country. Lastly, an understanding of this relationship could be fed back into long-term policies.

Whilst we must accept the fact that agricultural production and productivity is the result of many interdependent factors, as illustrated in Fig. 1.1, our approach essentially moves towards an evaluation of the influence of climate and weather. In order to achieve this we have to isolate these from other groups of factors, each of which is worthy of being considered as a subject by itself for individual study.

The thesis is divided into five sections. The first section includes two chapters; the first one is the introduction and the second one provides a general background on Iraq.

The second section (chapters 3 - 6) covers the socio-economic factors. Chapter 3 deals with the Iraqi economic issues in general and agriculture in particular, such as planning and investment between 1949/50 and 1975/76; the contribution of the agricultural sector to the GDP; exports; pricing and pricing policies; and marketing institutions. Chapter 4 deals with land inventory and land resources in Iraq. The main points emerging in this chapter are : factors affecting land inventory; land utilization; main agricultural crops and their geographical distribution. Chapter 5 deals with land tenure systems and land reform in Iraq. The main points in this chapter are : the development of the land tenure system in Iraq; the size of the holdings before and after the land reform of 1958; the implication of the land reform and its effect on agricultural production. Chapter 6 deals with the agricultural cooperative movement and extension services. The main points in this chapter are : some theoretical aspects; the development of agricultural cooperatives before and after the land reform law; problems associated with the agricultural cooperative movement; other farming organizations and, finally, extension services.

The third section of this thesis deals with technical factors affecting agricultural production and productivity, chapters 7 - 9. Chapter 7 deals with high yield varieties of crops (HYV's) and with fertilizers. The main points in this chapter are: area under HYV's of wheat; the contribution of HYV's of wheat to total production; the application of organic and chemical fertilizers; fertilizer distribution; average consumption; factors affecting the use of fertilizers. Chapter 8 deals with agricultural mechanization and its development. The main points in this chapter are : numbers and type of farm machinery sold and distributed in the country; the forms of ownership; the efficiency of use of farm machinery; the impact of farm mechanization on increasing agricultural productivity and on an intensive farming system; problems affecting farm machinery in Iraq. Chapter 9 deals with irrigation and water resources. The main points in this chapter are : water resources; the hydrology of the Euphrates and Tigris rivers; water control projects; irrigation methods; problems of the irrigated areas; the cost of land reclamation; future water resources available for irrigation water requirements; and finally the potential for increasing the irrigated area.

The fourth section consists of weather and climate studies, chapters 10 to 13. Chapter 10 contains a general review of weather-crop relationship studies. The main points in this chapter are : the needs for weather-crop relationship studies; the methods of analysing weather-crop relationship; data required for such studies; and a review of selected studies classified according to their objectives and countries. Chapter 11 deals with agroclimatic conditions in Iraq. There are four main points in this chapter : the first is related to the importance of the rainfed area of northern Iraq to wheat and barley production; the second deals with agricultural data required for such studies, such as production figures, cultivated area and yields. The third deals with the records of meteorological phenomena, i.e. precipitation, air temperature, soil temperature, evaporation and potential evaporation and relative humidity. Here we examine the data for the whole country as well as for the rainfed area. The last point deals with the growing seasons of wheat and barley crops. Chapters 12 and 13 deal with weather-crop relation studies for wheat and barley respectively. Three weather factors will be included in this analysis. These are : monthly and total rainfall; air temperature (minimum, maximum and mean); and monthly relative humidity. The absence or discontinuity of other meteorological data prevent us from utilizing them in this study. Correlation and regression analysis will be used in this study. An attempt will be made to study the effect of these weather factors on wheat and barley yields as well as an evaluation of the utilization of meteorological data for forecasting wheat and barley yields.

The fifth section, chapter 14 contains the final summing up and conclusion.

The nature of this study requires the use of a large number of data, presented as tables in the text, in order to show the reality of each individual factor and correlation. With reference to sources and accuracy of these statistical data, most of them are obtained from official sources, although it is rather difficult to assess the accuracy of all these data and there are considerable gaps in published records. Other data are also obtained from unofficial sources, i.e. theses, international organisations and individual researches.

1.3 The Period Under Study

The period covered in this study is that between 1949/50 and 1975/76. The period has been selected for the following reasons :-

- Formal economic development started in 1950 with the establishment of the Development Board.
- The financial changes which occurred since the increase in oil prices in 1973 started to have considerable effects on the economic and social structure of Iraq in general, and the agricultural sector in particular from 1975 onwards. Since then, it becomes necessary to extend the multivariate nature of any study very considerably and sufficient data is not yet available to make this valid.
- In 1976 there were major changes in administrative areas, the number of provinces, for example, increased from 16 to 18, making it difficult to assemble data for comparable areas after that time.
- Finally, a twenty-seven year period may be regarded as a sufficiently long time series for a reasonably valid analysis of climate and weather records for examination of the effects of all factors affecting agriculture during the pre- and post-land reform of 1958.

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CHAPTER TWO

BACKGROUND STUDY

2.1 Introduction

Modern Iraq, as a separate political entity, was created by the British occupation of the Basrah, Baghdad and Mosul provinces of the Ottoman Empire between 1914 and 1918.[1] Historically, this area was known as "Mesopotamia", the land of the two rivers, the Tigris and Euphrates, where some of the world's earliest traceable civilizations were nurtured. Most of these ancient civilizations were built on the basis of flourishing agriculture more than 8000 years ago.[2]

Iraq, as a new country, gained its independence in 1932 after centuries of regional rule by Mongols, Turks and more than a decade under the British Mandate.[3,4] The constitutional form of the government was a monarchy until 1958 when the country became a republic. The total area of Iraq is 438, 446 sq. km. (70,000 sq. miles).

2.2 Location

Iraq is situated in south-west Asia, known as the Middle-East, on the eastern edge of the modern Arabic world. The frontiers of modern Iraq follow no simple geographical and no racial criteria. They were shaped by events of the first world war and by the political and diplomatic compromises which followed.[5] Today, Iraq is bordered by Iran on the east, Turkey on the north, Syria on the north-west, Jordan on the west, Saudia Arabia on the south-west, Kuwait and the Arabian Gulf on the south. The country has only one access to the sea through a short coastline on the Arabian Gulf.

2.3 Administration

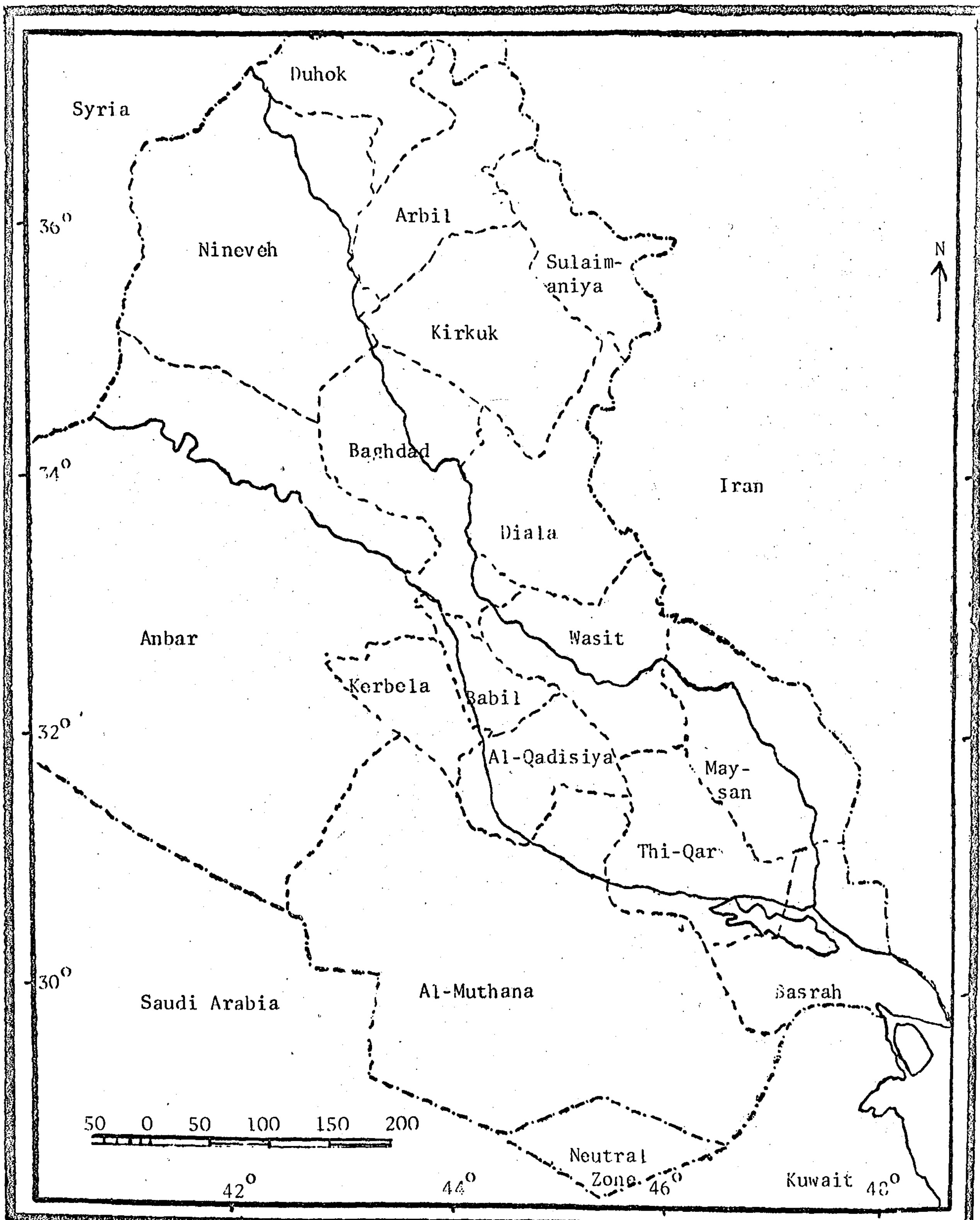
Iraq was first divided into fourteen administration units (provinces) called "Mohafadha". Two further provinces were created in 1969, namely Duhok and Al-Muthana. In this thesis, however, they are amalgamated with Nineveh and Al-Qadissiya provinces respectively, to ensure data homogeneity before and after the 1969 administration changes. Fig. 2.1 shows the administration units of Iraq in 1969. Another two provinces were established in 1976 bringing the total number of provinces to eighteen. Each province is further divided into several districts called "Gadha", and each district is divided into several sub-districts called "Nahia". Baghdad is the capital of the country and its largest city, situated in the centre of the country on the river Tigris.

2.4 Climate

The country lies between longitudes 38.42^{o} E and 48.23^{o} E and between latitudes 29.27^{o} N and 37.23^{o} N. With this location, the climate in general can be cold and rainy in winter, hot and dry in summer. The annual mean of rainfall for the whole country has been calculated to be 260 mm., but is lower in the south and increases towards the north and north-east. (6)

In general, we may distinguish three climatic zones; the arid, semi-arid and the desert. The Northern part of the country is considered to be the semi-arid zone where rainfall is sufficient for dry farming as we will see later in Chapter 11 . The semi-arid region can also be divided into two sub-regions; the high precipitation highland and the foothills with less precipitation. The arid region covers most of the lower plains and valleys of the Central and Southern parts of the country. Average precipitation is much below the average of the semi-arid region,and so

Fig. 2.1 Administration Units of Iraq in 1969



Source Al-Anni, K. (1972) : Iraq Agricultural Geography, Arab League, Cairo, p.11.

agriculture cannot be practised in this region without irrigation.

The desert in the west and south-west of the country is cold with occasional rain in winter and is hot and dry in summer. It provides good pasture for nomadic tribes during the spring season.

2.5 Physiographical Regions

Iraq can be classified into five broad physiographical regions as can be seen in Fig. 2.2. [7] These regions are:-

1. The Zagros mountains which are located in the north-east of the country. The altitude of these mountains varies from 1800 - 3600 m. above sea level. The mountains consist mainly of folded limestones and consequently the oldest rocks are exposed at the top of the mountain ranges.
2. The foothills region located at the foot of the Zagros mountains. This zone consists of conglomerate and sandstone sedimentaries and denudation products from erosion of the mountains.
3. The Jazirah region; consists of recent sediments mainly alluvial, with considerable formations of gypsum. The northern part is under grain cultivation during winter.
4. The northern (in some classifications known as western) and southern deserts. This region is dominantly calcareous with recent aeolian surface deposits.
5. The lower Mesopotamian Plain in the Central and Southern regions of the country. It consists of recent alluvial erosional products which have been carried by the two rivers.

A slightly different classification was presented by Saman, in which he classified the country into five regions and estimated the total

Fig. 2.2 Physiographic Units of Iraq.

Source: Buringh, P. (1960) : Soils and Soil Conditions In Iraq, Ministry of Agriculture, Baghdad, Iraq, p. 34.

Table 2.1 Topographical Type Areas by Extent and Proportion of Total Area of Iraq

Type of Area	Area sq. km.	Area+ (Million donums)	%
Deserts	170,522*	68.2	38.9
Zagros Mountains	92,000	36.8	21.0
Foothills	42,500	17.0	9.7
Mesopotamian plain	118,424	47.4	27.0
Water covered area**	15,000	6.0	3.4
Total area of Iraq	438,446	175.4	100.0

* Including half of the neutral zone.

** Including river basins, water reservoirs, marsh lands and territorial water.

\+ 400 donums = 1 sq. km. 4 donums = 1 hectare.

Source : Saman, B.B. (1973) : Some Light on Some Important Aspects of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq, Part one, page 45 (in Arabic).

area for each region.[8] Table 2.1 shows these regions as well as the total area. It is clear from this table that more than one-third of the country is desert, whilst the plain areas represent only 27 per cent of the country.

2.6 Population Growth, Migration and Employment

Iraq is still considered to be a growing and less populated country, with considerable potential importance in its natural resources, water and land for agriculture, and in minerals such as oil.[9,10,11] This means that the country has better economic prospects, especially in agricultural development than other countries in the Middle East, who lack one or other major resource.

2.6.1 Population Growth

Studying the population of Iraq reveals that Iraq has entered a period of demographic transition in which its population is increasing very fast.[12] Obviously, the classical explanation of these increases in the rate of population growth can be related to two main points; first of all the decline in the death rate, especially the infant mortality rate. This is mainly due to improvement in the medical services in the country. The second reason is that the birth rate or fertility is still very high and it is expected that it will continue to be high in the future.

The population of Iraq increased from 4.8 million in 1947 to 6.3 million in 1957, 8.05 million in 1965 and 12.00 million in 1977.[13,14] This means that the rate of population growth was 2.8 per cent between 1947 and 1957, and 3.3 per cent between 1957 and 1977, a rate of population growth amongst the highest in the world.

One effect of such rates of population increases appears in population density, for example, 11, 14, 18 and 27 persons per sq. km. in

1947, 1957, 1965 and 1977 respectively. If we considered, however, that 38.9 per cent of Iraq is desert (see Table 2.1) and can be excluded from the total area because it is not inhabited, except by some nomadic tribes, the population density would be 18, 24, 30 and 45 persons per sq. km. in 1947, 1957, 1965 and 1977 respectively. Even excluding the deserts, Iraq is still a relatively less populated country in the Middle East. For example, the population density in Kuwait, Bahrain, Syria and Lebanon is 44.4, 359.5, 34.0, 268.0 persons per sq. km. respectively.[15]

Directly relevant to our study is the effect of population growth on demand for agricultural products, especially foodstuffs. The demand for foodstuffs may be expressed by the following equation:-[16,17]

$$D = P + eg$$

	D	=	P + eg
Where	D	=	Demand for foodstuffs.
	P	=	The rate of population growth.
	e	=	The elasticity of demand for food.
	g	=	The per-capita income growth.

It is clear from this equation that any increase in the rate of population growth will increase the demand for food. Other models used for estimating the demand for food are based on improving calorie intake.

In the case of Iraq, one may safely assume that the demand for food is high and growing because: firstly, there is a high rate of population growth. Secondly, the elasticity of demand for food is high as in many developing countries. Thirdly, the rapid increase in per-capita income, especially after the large increase in oil revenues in 1973, is increasing per capita food consumption.[18]

2.6.2 Migration

In Iraq, as in many developing countries, a large proportion of its population is still engaged in different kinds of agricultural activities.[19]

Nonetheless, during the last three decades, the degree of urbanization has been very high. Table 2.2 reveals a few significant facts about the rural and urban population distribution between 1947 and 1977 in Iraq. It is clear from this table that the percentage of the rural population declined from 64 in 1947 to only 36.5 in 1977. Secondly, in actual figures, the rural population increased absolutely from 3.08 million in 1947, 3.85 million in 1957 and 4.39 million in 1977. Thirdly, the urban population increased from 1.73 million in 1947 to 2.44 million in 1957 and to 7.64 million in 1977.

The annual growth rate of the rural and urban population was 1.2 and 5.0 per cent respectively for the whole period between 1947 and 1977. But the annual growth rate of the rural and urban population was 2.3 and 3.5 per cent respectively during 1947-1957, whilst it was 0.07 and 5.9 per cent respectively between 1957 and 1977. It is clear that the biggest increase in urban population occurred between 1957 and 1977. Table 2.3 shows the percentage rates of increases in the rural and urban population. It is clear from this table that the urban population increased by 85.8 per cent on the figures of 1965.

It can be concluded, given the order of magnitude of the changes illustrated in Tables 2.2 and 2.3, that these changes cannot solely be explained by different differential rates of natural increases but must imply migration from rural to urban areas, especially during the period between 1957 and 1977. The complex process involved in this cannot be analysed in detail in this study, but some relative points will be made.

This high migration from rural to urban areas, especially to big cities like Baghdad has been studied in detail by Al-Rawi.[20] Although it is not easy to pinpoint all the reasons behind such rapid migration during the last three decades, they can be classed into two main periods

Table 2.2 Rural and Urban Populations in Iraq

	1947		1957		1965		1977	
	Population	%	Population	%	Population	%	Population	%
Rural	3,082,358	64.0	3,853,754	61.2	3,935,616	48.9	4,389,085	36.5
Urban	1,733,827	36.0	2,445,222	38.8	4,111,799	51.1	7,640,675	63.5
Total	4,816,185	100	6,298,976	100	8,047,415	100	12,029,760	100

Sources :

1. Hashim, J., et al (undated) : Evaluation of the Economic Development in Iraq (1950-1970), Table 4 , page 8, Ministry of Manning, Baghdad, Iraq, (in Arabic)
2. Alwan, A.S. (1978) : The Involvement of the Poor in Development Through Rural Organizations in Iraq, Table 3, page 5, F.A.O., Rome, Italy.

Table 2.3 The Percentage of Rural and Urban Population Increases

Population	1957	1965	1977
Rural	25.0	2.1	11.5
Urban	40.7	68.5	85.8

Source : Calculated from Table 2.2

divided by major political institutional changes in 1958, for example, land reform.

The first set of reasons for rural emigration relates mainly to the period between 1947 and 1958. These are : the discouraging land tenure system; the sharecropping system in which the landlord's share of the product varied from one-third to one-half in most of the central and southern parts of the country; the floods which used to occur quite frequently; low rural income as the result of low productivity and sharecropping; soil salinity which affects most of the Central and Southern regions; the attraction of big cities in jobs, education and health, and finally tribal conflict which disturbed the peace in rural areas.[21,22].

The second set of reasons refers to the period between 1958 and 1977. Among these reasons are land reform and associated adjustment; soil salinity which became more serious; the increasing attraction of big cities with good job opportunities as a result of rapid industrialization, especially after the oil prices increase in 1973; and relatively low incomes in rural areas as a result of low productivity.

The high rate of urbanization may cause many problems in urban areas, for example, housing, transport, education, health, unemployment, etc.[23] As for agriculture, it seems that rural-urban migration has caused labour shortages, especially in peak agricultural seasons. This shortage may cause a decline in agricultural production, especially in situations where agriculture is not very highly modernized.[24]

2.6.3 Employment

Another relevant element in our consideration of population is the active population and the participation of the labour force in the economic development of the country. Generally speaking, there are two main sources of statistical data available on agricultural employment and the labour force in Iraq. The first type of data comes from the agricultural censuses of 1952/53, 1958/59 and 1971. The second source of data is provided by the population censues.

According to the 1952/53 agricultural census, the total number in agricultural employment was 1,400 ,152 people.[25] There were 462,516 holder operators, with family workers included in this number. This number, however, does not include young children, nomadic people, and village dwellers who were not doing any agricultural work.

The total number of employment in agriculture was 1,590,383 workers according to the 1958/59 agricultural census.[26] This number shows an increase of 190,231 workers, or an increase of 13.6 per cent between 1952/53 and 1958/59, in spite of the out-migration to urban areas. The total number in agricultural employment was 2,110,595 workers in 1971.[27] This number shows an increase of 520,182 workers between 1958/59 and 1971, or an increase of 32.7 per cent. It is clear from these statistics that the annual growth rate of agricultural employment was 2.3 per cent for the period between 1952/53 and 1971.

Analysing the sex composition of the agricultural employment figures according to these three agricultural censuses,Table 2.4 shows a steady decline in the number of males employed. The percentage of male employment to total agricultural employment was 66.3, 61.1 and 59.4 in 1952/53, 1958/59 and 1971 respectively. Nonetheless, the actual number of male employment increased from less than a million in 1952/53 to one and a quarter million in 1971.

Meanwhile, the percentage of female agriculture employment increased from 33.7 in 1952/53, to 38.9 in 1958/59 and to 40.6 in 1971 (see Table 2.4). This increase in the contribution of the female labour force to total employment in agriculture may be caused by two reasons. First, the migration of the male labour force to large cities. This will result in a shortage of labour force in general, or, more specifically, when the male members of the family leave for the cities this forces the female members of the family to look after the land. To prove this point, the 1971 agricultural census shows that 95 per cent of the female employment was unpaid labour, essentially unskilled family labour.[(28)] The second reason could be related to changes in the female attitude towards jobs.

Studying the age distribution of the agricultural employment figures, Table 2.4 reveals that there was a proportional decline in the participation of males under fourteen years of age in agricultural employment. The percentage of those under fourteen declined from 21.2 in 1952/53, to 10.4 in 1958/59 but with a slight increase to 11.7 in 1971. This increase in 1971 could be related to changes in age classification. Although there was no data available on the percentages of females under the age of fourteen to total employment in 1952/53, one may assume it would follow the same pattern as the percentage of males. Probably this was mainly due to the establishment of a better education system in rural areas which absorbed many children.

The second source of data on agricultural employment comes from the population censuses. However, before discussing the size of employment according to the population censuses, it might be useful to discuss very briefly the age distribution of the Iraqi population. This will reveal the size of the active population in the country.

According to the 1957 population census, the age distribution of the population was as follows: 44.8 per cent was under fifteen years old, 49.9 per cent between 15-60 years old and only 5.3 per cent was over 60 years old.[(29)] This means that half of the population is considered to be potentially active. The 1965 population census shows that 47.9 per cent of the total population was under the age of fifteen, 45.0 per cent was

Table 2.4 Sex and Age Distribution of Employed Agricultural Workers

Sex and age distribution	1952/53		1958/59		1971	
	Employment	%	Employment	%	Employment**	%
Male over 14	631,083	45.1	805,792	50.7	1,007,981	47.7
Female over 14	*		483,180	30.4	653,851	31.0
Male under 14	297,613	21.2	165,752	10.4	246,224	11.7
Female under 14	*		135,659	8.5	202,509	9.6
Total Male	928,696	66.3	971,544	61.1	1,254,205	59.4
Total Female	471,456	33.7	618,839	38.9	856,360	40.6
Grand Total	1,400,152	100	1,590,383	100	2,110,565	100

* Data not available

** The age distribution changed to under 15 and over 16 years.

Sources:
1. Ministry of Economics (1954) : Reports on the 1952/53 Agricultural and Livestock Census in Iraq, Table 5 , page 11, (in Arabic)
2. Ministry of Planning (1961) : Results of the Agricultural and Livestock Census in Iraq for the year 1958/59, Baghdad, Iraq, Table 8 , page 10, (in Arabic)
3. Ministry of Planning (1973) : Results of 1971 Census of Agriculture, Baghdad, Iraq, tables 39A, 39B, 39C, and 39D, pp. 132-35.

between 15-60 years old and only 7 per cent was 60 years and over. From these statistics the following points can be derived; first, it might be safe to assume that the potentially active population is almost fifty per cent of the total population. Second, the inactive population, particularly that less than fifteen years old, is very high. This rising youth dependency might affect the future structure of population in terms of labour force, employment, etc. Also, this may maintain a high rate of population growth in the future.

Nonetheless, the 1957 population census reveals that only 1.76 million people were employed out of 6.3 million. In other words, nearly 28 per cent of the total Iraqi population gained full time employment. In 1965, the population census reveals that nearly 25 per cent of the total Iraqi population were employed.(30)

Classifying employment into rural and urban areas, Table 2.5 reveals that 1.21 million employed people were in rural areas in 1957. This means that that the rural areas provided 68.7 per cent of the job opportunities in that year. The urban areas, on the other hand, provided only 31.3 per cent of the total employment. The total employment in 1965 was 1.41 and .569 million in rural and urban areas respectively. This means that the percentage of employment in rural areas increased from 68.7 in 1957 to 71.3 in 1965, whilst the percentage of employment in urban areas decreased from 31.3 in 1957 to 28.7 in 1965. The reason for declining employment in urban areas was mainly related to their better education system. In urban areas more people of working age go to school or higher education than in rural areas.

Comparing data from two sources is very difficult because; first, the time lapse between the population and agricultural censuses. Second, the definition of employment, age classification and other technical terms are not necessarily the same. So, any comparison attempt of such data must

Table 2.5 Total Urban, Rural Employed Population in 1957 and 1965

Population	1957			1965			% of increase in employed population
	Employed population	% total employment	% specific employment	Employed population	% total employment	% specific employment	
Urban areas							
Male	446,044	25.3	80.7	448,706	22.6	78.9	0.6
Female	106,830	6.0	19.3	120,042	6.1	21.1	12.4
Sub-total	552,874	31.3	100	568,748	28.7	100	2.9
Rural areas							
Male	713,540	40.4	58.8	828,473	41.8	58.7	16.1
Female	499,231	28.3	41.2	584,061	29.5	41.3	17.0
Sub-total	1,212,771	68.7	100	1,412,534	71.3	100	16.5
Grand total	1,765,645	100		1,981,282	100		12.2

Source: Hashim, J., et al (undated): Evaluation of the Economic Development in Iraq (1950-1970), Table 5, page 10, Ministry of Planning, Baghdad, Iraq, (in Arabic).

be appoached with caution. For example, comparing the numbers in employment from the population census of 1957 with the number in employment from the 1958/59 agricultural census reveals that the agricultural census shows slightly higher figures. This difference is due to differences in definition as mentioned earlier.

Considering the importance of agricultural employment to total employment in the country, it seems that just over 50 per cent of total employment occurred in the agricultural sector until the mid seventies.[31] But, according to the 1977 population census, the numbers employed in agriculture dropped dramatically to only 943,890 people. Bearing in mind that the total employment was 2.11 million people in 1971, this means that nearly 1.17 million workers left the agricultural sector . In this case employment declined at a rate of 14.8 per cent annually. Table 2.6 shows the distribution of employment according to each economic sector in 1977. In these circumstances, it seems, without any doubt, that the agricultural sector suffered from labour shortages during the mid seventies onwards. This is probably why the government has encouraged immigration from other Arab countries such as Egypt and Morocco to work in agriculture by providing settlers with land, credit and other facilities.

2.7 Profile of the Iraqi economy

Until recently the most distinguished aspect of the economy of Iraq was its dependence on two economic sectors: oil and agriculture. Agriculture is very important to the economy of Iraq for three reasons: first, the number of people depending for their living on agriculture was and is high. Secondly, in terms of contribution to the national income, excluding oil, the largest proportion of the GNP was generated in agriculture. The importance of this contribution has declined recently

Table 2.6 The Distribution of Employment According to Economic Sectors

Economic sectors	Employment	%
1. Agriculture, forestry and fishing	943,890	30.1
2. Mining and quarrying	36,835	1.2
3. Manufacturing industries	284,395	9.1
4. Construction	321,695	10.3
5. Electricity, water and gas	23,190	0.7
6. Transport, communication and storage	177,799	5.7
7. Wholesale and retail trade	224,104	7.1
8. Banking and insurance, real estate, agency etc.	31,089	1.0
9. Social and personal services	957,979	30.6
10. Unknown	58,237	1.8
11. Unemployed	74,725	2.4
	3,133,939	100

Source : Ministry of Planning, unpublished results of the 1977 Population Census, Table 50 .

as the result of the development of other economic sectors, oil in particular (see page 65). Thirdly, agriculture was very important in earning foreign exchange. A large proportion, by value, of exported goods came from agricultural sources (page 74).

The oil sector, on the other hand, has become the important factor in generating the GNP, economic development and foreign exchange.(32) Oil revenue has been critical to development since 1950. Basically, all oil revenue was allocated to economic development at the beginning of the development programmes. Later it was reduced to 70 per cent in 1952 and, consequently, to 50 per cent in 1959, increasing oil revenue being the reason for such reduction.(33)

Planned economic development in Iraq started as early as 1950 when the Development Board was established.(34) Nonetheless, on the eve of the 1958 revolution, the socio-economic conditions of the Iraqi people approximated to a classic third world model: high illiteracy; poor living conditions; 3 per cent of the population controlled over 95 per cent of the nation's wealth.(35, 36) In the case of agriculture, most of the cultivable land was owned by a few absentee landlords, and hence this amounted to absolute power over farmers on their lands through the system of sharecropping. (37)

Since 1958, the government adopted a policy to ensure rapid socio-economic development and better distribution of the nation's wealth. Such a policy is based on two basic elements: first, redistribution of land resources to the peasant farmers according to the 1958 Land Reform Law and other land reform laws (Chapter Five), and secondly, through the encouragement of the public sector, which has been gradually built up in all economic sectors including agriculture, as we will see later.(38)

Generally speaking, the per capita income increased from I.D.90.4

in 1968 to I.D. 387.2 in 1976 at current prices, and is probably higher now as a result of a further increase in oil revenue in particular.[(39)] Nonetheless, available evidence suggests there is a difference between rural and urban population per capita incomes.[(40)] These differences probably come as the result of low agricultural productivity, partly associated with the sharecropping system, and of poor marketing institutions which led to farmers' exploitation (see Table 3.9).

2.8 Conclusion and Final Remarks

This chapter has revealed the following points: first, Iraq can be divided into five physiographic regions; mountains, foothills, deserts, the Jezirah and the central and southern plains. Secondly, the climate in Iraq is suitable for dry farming in the rainfed areas of nothern Iraq, but elsewhere produce depends on irrigation. Thirdly, the rate of population growth was 3.3 per cent for the period 1957-1977, among the highest national birth rates in the world. Fourthly, it seems there was a rapid migration from the rural to urban areas, especially during the late seventies when the rate of urban population growth was 5.9 per cent. This high degree of urbanization has left the country with serious problems in urban areas as well as in rural areas, shortage of labour in agriculture among the latter problems. Fifthly, the economy of Iraq depends largely on two sectors; oil and agriculture. Oil is important to the GNP, foreign exchange and economic development, whilst agriculture is important in terms of people engaged in agricultural activities. Also, a large proportion of the GNP is generated in agricultural activities. The contribution of the agricultural sector to foreign trade has declined and the country has become more dependent on imported food.

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(28) Ibid, Table 39, p.131.

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SECTION TWO

CHAPTER THREE

PLANNING AND DEVELOPMENT OF THE AGRICULTURAL SECTOR

3.1 Introduction

Almost all developing countries have now adopted planning as a means of assisting themselves to achieve self-sustained economic growth.[1] Iraq as a developing country is no exception, and became a pioneer in adopting economic development planning in the Arab world in 1950.[2]

One of the targets of the economic planner is, as far as possible, to approach net self-sufficiency in agricultural commodities and to reduce unnecessary and/or hazardous dependence on imported staple foodstuffs. This bearing in mind that a large proportion of the consumer's budget in developing countries is spent on food consumption and that the expected demand for agricultural products will increase during the programmes of economic development. As considered in section 3.8.2 in Iraq today this may even appear as a need for import substitution in agricultural rather than only in industrial commodities.

Considering, however, all the factors shown in Fig. 1.1 which affect agriculture, it becomes rather difficult to achieve planned targets in the economic development of the agricultural sector as part of integrated economic development.[3]

There are three aims in this chapter : firstly, the study of development programmes in Iraq with special reference to agriculture. Secondly, assessing the effects of such development on the contribution of the agricultural sector to the national income, foreign trade and imports. Finally, prices, pricing policy and marketing systemsof the agricultural products will be reviewed as a part of the general economic development programmes.

3.2 Progress of Economic Development in Iraq

Economic planning or economic development in Iraq may be considered in four stages. The determination of these stages is based on either changes in the economic conditions or political institutions of the country.

The first stage was economic development with limited resources. This period extended from the establishment of the national government in 1932 to 1950. Investment programmes were on a very small scale at that time. (4.5) Table 3.1 shows the government expenditure on capital works and its proportion to the total government expenditure between 1932 and 1950. The second stage of economic development was development with apparently unlimited finance. This stage was from 1950 to 1959. Development programmes were carried out by the Development Board and Ministry of Development. The third stage of economic development followed the 1958 revolution. Economic development plans were carried out by the Planning Board and the Ministry of Planning. This period extended from 1959 to 1974. The last stage of economic development is from 1975 onwards. Economic development programmes during this period have been carried out with a substantial increase in financial resources as results ofthe oil boom of 1973. As becomes apparent later in examining time series statistics for agricultural production and climate, some of these stage changes have to be recognized as significant.

In this chapter, we will concentrate on economic development during the second and third stage, with special references to agricultural development. These two stages cover approximately the period between 1950 and 1975.

3.3 Characteristics of Economic Development in Iraq

The main characteristics of economic development are: firstly, the development plans are almost wholly financed by the government. As a result, the public sector has dominated most of the economic activities in the country. This domination, however, was increased after the nationalization of large

Table 3.1 Expenditure on Capital Works and its Percentage Proportion (%) to the Total Government Expenditure

Year	Million I. D.	%	Year	Million I. D.	%
1933	0.43	10.3	1942	0.98	8.4
1934	0.42	9.8	1943	1.65	10.7
1935	1.03	18.2	1944	0	0
1936	2.18	30.5	1945	1.54	7.2
1937	2.37	27.6	1946	3.05	11.9
1938	2.46	27.2	1947	3.57	13.4
1939	2.23	24.6	1948	3.93	12.3
1940	2.71	27.5	1949	3.38	11.3
1941	0.96	11.0	1950	3.60	12.3

Source : Qubain, F.I. (1958) : The Reconstruction of Iraq : 1950-1957, Frederick A.Praeger Publisher, New York, Table 4 , p.21.

private companies in 1964, whilst in agriculture it was advanced by the 1958 land reform law. This situation left the private sector not playing a significant role in national economic development.[6] Although the private sector has emerged as a little more important for development in recent years, the argument for and against the value of the private sector has changed several times.[7] Secondly, development plans were and are mainly financed by oil revenue. All the oil revenueswere allocated to economic development in 1950, although reduced to 70 and 50 per cent in 1952 and 1959 respectively. Thirdly, due to high dependence on oil revenues, economic plans were and are associated with financial uncertainty.[8,9] Fourthly, frequent changes of government economic policy as results of changes in government meant that the change in emphasis from one economic sector to another was also quite frequent, as we will see later.[10,11]

3.4 Economic Development Between 1950-59

The vast oil revenue after 1950 which accumulated a large reserve encouraged the government to accelerate economic and social changes in the country.[12] This increase in oil revenue was mainly due to increase in real production for exports and to a new agreement on prices with oil companies.[13,14] In addition, many Iraqi people were aware of the need to improve the socio-economic conditions of the Iraqi people through better utilization of national resources.[15]

In 1950, the government started seriously thinking of establishing the most efficient way to carry out development programmes, and in that year the government decided to establish an independent board which had the responsibility of surveying natural resources, planning and execution of the development programmes.[16, 17, 18] The Development Board was established by Law No. 23 of 1950 as an independent development agency. This board was responsible for the planning and execution of the development programmes. Meanwhile, the government requested the International Bank for Reconstruction and Development to send a mission to Iraq to undertake a general review of the country's economic possibilities and to make recommendations for economic programmes.[19] The idea behind establishing an independent development board was to separate the development programmes from political influences which would help to maintain uninterrupted a flow of consistent development programmes.[20] The president of the Development Board was the Prime Minister. The members were the Minister of Finance, and six executive members, one of whom must be an expert in finance, another in irrigation and the third to be specified by the cabinet.[21] Two of the executive members were foreigners, one British and one American.[22] In 1953, the power of the Development Board was restricted by law through the creation of the Ministry of Development and the new minister became a member of the Development Board.[23]

The Development Board during its life formulated two development programmes. The first development programme was issued on the 3rd May, 1951 for the period 1951-1955. This development programme, however, was amended on March 24, 1952 to cover the period between 1951 and 1956, this a reaction to increasing the oil revenue. The planned government allocation in the amended programme was I.D. 155,374 thousand, of which agriculture received I.D. 76,360 thousand, or nearly 49 per cent of the planned allocation.[24]

As a result of several factors, such as studied by the IBRD, Lord Slater and Iverson, mounting criticism from the Iraqi people and finally increasing oil revenue, the execution of this programme was stopped in April, 1955.[25,26,27] The second development programme was issued in April 1955, also to be amended in 1956. In this amendment, the government planned allocation increased from I.D. 304,306 thousand to I.D. 500,008 thousand, and the period of the programme was extended from five to six years. In this programme agriculture received I.D. 168,042 thousand, or 33.6 per cent of the government planned allocation.[28]

Table 3.2 shows the planned government investment for each economic sector in these development programmes. In general, this table reveals that agriculture, transport and communication, building and services and industry received 35.3, 28.2, 22.2 and 14.3 per cent respectively of total government planned investment, i.e. agriculture, transport and communication, building and services and industry were in first, second, third and fourth place respectively in terms of planned government investment. It is obvious that the then governments emphasised agricultural development. However, we need to analyse the type of investment in agriculture during this period.

Planned government investment for the agricultural sector can be grouped under two main heads; first, engineering projects, such as reservoirs, irrigation and drainage projects,etc., and second, agricultural services consisting of farm machinery, improving farm and livestock production, forestry and land reclamation,etc. Table 3.2 indicates that 90.2 per cent of the planned government investment went to the first group and 9.8 per cent was planned for agricultural services.

It is obvious from such investment programmes that the emphasis was to expand the cultivated area by introducing new irrigated areas, rather than improving agricultural productivity on existing farmland.(29) Data available on agricultural investment during this period suggests that the largest proportion of that investment in the first group was actually allocated for flood control and water storage of the two rivers. (30)

Analysing the actual government expenditure of these two development programmes, Table 3.3 shows the distribution of actual government expenditure and sectoral percentage of total expenditure. As can be seen from this table, building and services, agriculture, transport and communications and industry were in first, second, third and fourth place respectively. This table also shows that almost 90 per cent of the total agricultural expenditure went to engineering projects, whilst agricultural services received only 10 per cent.

Generally speaking, economic development depends to a large extent on the implementation of the development plans themselves. In that sense, to examine the success of implementation, one must look at Expenditure Efficiency, which is the ratio of actual expenditure to planned investment. Table 3.4 reveals that expenditure efficiency for the period between 1951-59 was 53.3 per cent, whilst it was much lower during the implemention of the first programme (1951-54).

Analysing the expenditure efficiency for each economic sector for the 1951-59 period, Table 3.4 shows that building and services were in first place, transport and communication and industry were approximately equal second, whilst agriculture was in third place. This means that although agriculture was allocated the largest share of the planned government investment during this period, the performance was lowest in this sector. Low actual investment in agriculture is not unique in Iraq but it is also normal in many developing countries.(31)

Annual data on planned government allocation, actual investment and expenditure efficiency are shown in Appendix A, Tables A.1, A.2, A.3, A.4 and A.5 respectively. These data reveal that there was an annual fluctuation in government policy in terms of allocation and expenditure which might reflect the absence of consistency in development policy, and/or result from other factors such as variability in financial resources.

Theoretically speaking, the emphasis between 1951 and 1959, and the giving of priority to development of the agricultural sector in which 60 per cent of the population were engaged, was logical. (32) Such agricultural development policy in fact depended to a large extent on increasing water availability and irrigation and drainage systems rather than vertical development. It is already noted that the largest proportion of agricultural investment went to water control projects and to a less extent to irrigation and more particularly to drainage facilities. For example, the total planned government investment for drainage was only 15 per cent of the total agricultural investment during the 1955-1959 development programme, whilst the actual expenditure on drainage facilities was 10 per cent of the total agricultural expenditure during the same period.(33) One cannot deny that the controlling of physical environment conditions, especially water resources, is a very important element of development programmes, in general, and agricultural development in particular, especially in semi-arid regions.

The Iraqi emphasis on flood control projects in particular and irrigation projects, however, also reflects the socio-economic and political circumstances in the country in the 1950's.

For example, the landlords, who controlled the largest cultivated areas, were not primarily interested in improving either agricultural productivity or the living conditions of the sharecropping farmers. On the contrary, they were mainly interested in increasing their incomes through expanding the cultivated area. Moreover, this method involved them in less expense because they did not have to pay for the cost of construction of the irrigation schemes or running water. Landlords, who formed a large bloc in parliament, encouraged land expansion policies. This tended to reinforce the government's efforts to control the floods from which Iraq suffered so much in the past. This point becomes very clear if we consider the number of dams and water storage projects, which were planned during this period, to control water flow in the two rivers. In addition, it always seems easier to macro-planners to start with large engineering projects such as dams and reservoirs rather than small projects involving agricultural services.(34) This can also be related to the absence of statistical data reflecting the people's real needs. This emphasis on large engineering projects has also been noticed in other Middle Eastern countries, as well as most LDC's.(35)

The development policy of the Development Board has been criticized by many Iraqi as well as many other experts who were invited to work in Iraq. [36, 37, 38] As far as this study is concerned, the only criticism which may arise is that the emphasis on large engineering projects leads to a slow or limited return in both social and economic terms and especially in improving agricultural productivity, as we will see later in other chapters. This imbalance in the economic development programmes, especially in agricultural development,was recognized by the IBRD. [39] It might be mooted also that, as we will see later, the technical and environmental difficulties in improving traditional agriculture in a semi-arid country such as Iraq further encouraged the reliance on major engineering solutions.

3.5 Economic Development Between 1959-1974

After the 1958 revolution, the new government abolished the Ministry of Development and the Development Board. Instead, the Ministry of Planning and a Planning Board were established. Several further changes have happened to the planning organization until it achieved its recent form. [40, 41, 42]

The main task of the Planning Board is to draw-up comprehensive national plans for medium-length periods of time, for example, a five year plan. It is also responsible for setting up the annual plan which is part of the original plan and, finally, the Planning Board is responsible for proceeding and following-up the progress of the development plan. The Planning Board is assisted by a "Steering Committee" which is responsible for analysing the development plan, after which the plan is put before the Planning Board for the final discussion. [43]

To avoid any confusion or conflict of views on agricultural development a High Agricultural Council was set up in 1970. The role of this council is to receive the proposed investment programmes from the Ministry of Irrigation, Agriculture and Agrarian Reform and Soil and Land Reclamation Administration.

These projects are assessed by the Council from all aspects and then they are returned to the ministries concerned with instructions and adjustments. When all the necessary modifications are made, the proposed projects are sent to the Ministry of Planning and consequently to the Planning Board to be included in the plan.(44)

Briefly speaking, the main differences between the planning organization before and after the 1958 revolution are: firstly, the separation between the plan's execution and formulation.(45) The Planning Board is only responsible for drawing up plans, whilst execution is left to the ministries concerned. Secondly, political involvement in the economic development decisions is greater, for example, if members of the single political party are members of the Planning Board.(46,47)

Four plans were drawn up during this period, two short provisional plans, 1959-61, 1961-64, and two five year comprehensive national plans. Table 3.2 shows the planned government investment for each plan during this period. Analysing the planned government investment for the 1959-61 provisional plan, Table 3.2 reveals that 48.3 per cent of the total planned investment went to building and the services sector. Probably the most obvious reason for that was to gain political support, but this weighting also was a result of criticisms of earlier Development Board policy for neglecting social and human resources.(48) Transport and communication, agriculture and industry were in second, third and fourth place respectively; 22.4 per cent of the total agricultural planned government investment was allocated to agricultural services, e.g. extension works, etc. in this plan.

The second economic plan was for 1961-1964 with planned government investment in the economic sectors of I.D. 442,194 thousand (see Table 3.2). In this plan, distribution of the planned investment was more evenly spread amongst the economic sectors than the previous plan, with top priority going to industry which received 27.5 per cent of the planned government investment. Building and services, transport and communication and agriculture received

26.8, 26.0 and 19.7 per cent of the total allocation respectively. Meanwhile, agriculture services received 27.3 per cent of the total allocation for the agricultural sector.

The third development plan is the first in a series of more comprehensive national five year plans, and after almost fifteen years in planning experience, that for 1965-69 is considered to be the first truly comprehensive plan covering the economic activity of the private and public sectors. Table 3.2 shows that the total planned government allocation in this plan was I.D.540,956 thousand, of which the agricultural sector received 27.2 per cent. Again in this plan top priority went to industry, agriculture in second place, building and services in third place and transport and communication in fourth place. Table 3.2 shows that 48.3 per cent of the total planned government agricultural investment went to agricultural services, the first time agricultural services received such substantial allocations.

The fourth plan for the period 1970-74 was introduced to the country in April 1970. The plan was a much more detailed one, covering the public and private sectors, integrating investment, consumption, production, employment, exports, imports and other economic activities so as to achieve the defined economic and social targets. For the first time, this plan included a set of coordinative monetary, fiscal and trade policies.(49) In this plan, agriculture received 29.1 per cent of the planned government allocation, lying in second place after industry (See Table 3.2). Also, in this plan, agricultural services received 59 per cent of the total agricultural planned investment.

As for the whole period between 1959 and 1974, Table 3.2 reveals that industry, building and services, agriculture and transport and communication were in first, second, third and fourth place respectively in terms of planned government investment. Therefore, planned government investment in agricultural services was increased substantially, especially during the last two plans.

Summing up the discussion on the planned government investment between 1959-1974 reveals the following three points: firstly, the two plans, and especially the first plan (1959-61) put more emphasis on the building and services sector. After the 1958 revolution, the government promised a root change in the socio-economic conditions of the Iraqi people and they remarked that the previous development did not consider the social and human resources in economic development. The new policy is well reflected in the allocation emphasis of the 1959-61 and 1961-64 plans. The second point is a shift in emphasis from agricultural to industrial development. Table 3.2 shows that the proportion of industrial planned government investment to the total planned investment increased from 10.4 in the 1959-61 plan to 31.0 per cent in the 1970-74 plan. Although planned investment in the agricultural sector increased from 14.4 per cent in the 1959-61 plan to 29.1 per cent in the 1970-74 plan, it was below the investment level of the first period (1951-59). It seems that this was a major set-back for agricultural development, particularly since agricultural investment should have been substantially increased during this period when investments were most needed as a result of the 1958 land reform law implementation and its implications. The third point, however, is an improvement in the type of agricultural investment, well reflected by the gradual increase in agricultural services investment which rose from 22.4 per cent in 1959-61 plan to 59.0 per cent in the 1970-74 plan. Increasing investment in agricultural services was the result of many factors: first, a relative decline in engineering programmes, especially between 1959-69. During this period most of the dams, reservoirs and barrages were either completed or near completion (See Table 9.2). Most of the planned investments during this period, especially in the 1965-69 plan went for feasibility studies for new engineering projects, improving the existing projects and improving the embankments of the two rivers. (50) As for irrigation and drainage projects, information available shows that during the 1965-69 plan several contracts were awarded to start work on many new irrigation and drainage projects. The second reason for increasing proportional investment in agricultural services, especially between 1965 and 1974 was due to greater government control of and involvement with the agricultural production sector, through, for example, state farms, farm machinery rental organisations, extension services as well as other operations, as we will see in the following chapters.

As far as the actual government expenditure is concerned, Table 3.3 shows that industry, building and services, transport and communication and agriculture received 32.8, 25.2, 21.3 and 20.7 per cent of the total government expenditure during the 1959-74 period. It is clear from this table that a large proportion of the actual government expenditure went to the building and services sector parallel to planned government investment during the 1954-61 and 1961-64 plans, whilst actual government expenditure on this sector declined during the 1964-69 and 1970-74 plans.

Actual government expenditure on the industrial sector gained a continuous increase from 11.7 per cent in the 1959-61 plan to 37.2 per cent in the 1970-74 plan, while, on the other hand, actual government expenditure on agriculture fluctuated from one plan to another. But, generally speaking, the proportion of the actual government expenditure on agriculture during this period was below that of the 1951-1959 period. The lowest actual government expenditure was 9.9 per cent during the 1961-64 plan, and the highest one was 23.5 per cent during the 1970-74 plan. However, Table 3.3 shows that actual government expenditure on agriculture services gradually improved from 18.6 per cent in the 1959-61 plan to 44.7 per cent of the total actual government expenditure on agriculture during the 1965-69 plan, and probably it was on the same scale during the 1970-74 plan.

It is obvious that during the 1959-74 period there was a gradual increase in emphasis on industry in terms of planned and actual government investment. Table 3.4 shows expenditure efficiency for each economic sector and according to each individual plan, as well as for the whole period between 1959-74. In the case of the whole period 1959-74, this table reveals that expenditure efficiency was 67.13, 60.20, 55.62 and 47.23 per cent for industry, transport and communication, building and services and agriculture respectively. The highest achieved expenditure efficiency was 84.3 and 80.9 per cent in industry and the transport and communication sectors during the 1970-74 plan and the lowest expenditure efficiency was 22.83 per cent in agriculture during the 1961-64 plan.

Summing up the foregoing discussion reveals that agricultural development lost its predominance to industrial development in particular and to other economic sectors in general during the 1959-74 period. The emphasis was on social and human resources development during the 1959-61 and 1961-64 development plans.

3.6 Economic Development From 1975 Onwards

This is the fourth period of economic development in Iraq. This period is characterized by the fast increase in oil revenue after 1973 which was caused by the increase in the world market price. Consequently, as the result of unexpected annual increases of oil revenue, the government revised the annual planned investment and expenditure in order to match such increases.

This period is covered by the 1975 provisional plan for nine months and the 1976-80 national economic development plan. Although the effects of the increase in oil revenue was felt during the last two years of the 1970-74 plan, it was thought better to include these two years in the previous period (1959-74) as a part of the whole 1970-74 plan.

Information on the actual planned government investment or expenditure, especially for the 1976-80 plan is hard to obtain, partly because of the continuous revising of the plan, but perhaps also as a matter of security and a reluctance to publish data in official documents. Table 3.2 shows the planned government investment between 1975-77. The emphasis on industrial development is very obvious during this period, when almost half of the planned government investment on economic sectors went to industry. In spite of the increase in the planned government investment in agriculture, its share of the total planned government investment was nearly one-fifth, which put agriculture in second place after industry.

Data on actual government expenditure is available only for the 1975 plan. Table 3.3 reveals that agriculture received only 15.9 per cent of the total actual government expenditure, which puts agriculture at the bottom of the expenditure scale. Industry, on the other hand, received 46.1 per cent of the total expenditure which put it in the first place.

Expenditure efficiency was 83.15, 64.77, 53.75 and 48.15 per cent in transport and communication, industry, building and services and agriculture respectively (See Table 3.4). It is not surprising to see expenditure efficiency in the communications sector was at the highest level because the congestion in ports and on roads had very obvious and critically damaging results. A shortfall in agricultural production in a country able to pay for imports is less obviously dangerous.

3.7 The Outcome of Economic Development

In the last section the planned government investment and actual expenditure of each economic development plan was reviewed between 1951 and 1977. The essential features of development efforts during this period may be summarised as follows: first, the government policy towards agricultural development was frequently changed. In the early stages of economic development (1951-59) more emphasis was put on agricultural development in general, and on flood control and irrigation and drainage projects in particular. Such a policy meant increasing production by expanding the area under cultivation rather than increasing agricultural productivity. Available evidence suggests that a relatively small amount of investment was actually spent on irrigation and drainage projects. The impact, moreover, of these

Table 3.2 Planned Government Investment in Economic Development Plans and Programmes, 1951 - 1977

(Thousand I.D.)

Economic sector / Development programmes	Agriculture: Reservoirs, Irrigation, Drainage	Agriculture: Agricultural Services	Agriculture: Total	Industry	Transport and Communication	Building and Services	Total
1951 - 1954	32,914	6,300	39,214	14,050	18,742	15,928	87,934
%	83.9	16.1	44.6	16.0	21.3	18.1	100
1955 - 1959	125,755	10,860	136,615	57.119	121,868	94.556	410,158
%	92.1	7.9	33.3	13.9	29.7	23.1	100
1951 - 1959	158,669	17,160	175,829	71,169	140,610	110,484	498,092
%	90.2	9.8	35.3	14.3	28.2	22.2	100
1959 - 1961	35,300	10,219	45,519	32,779	84,852	152,087	315,237
%	77.6	22.4	14.4	10.4	26.9	48.3	100
1961 - 1964	63,375	23,814	87,189	121,714	114,960	118,331	442,194
%	72.7	27.3	19.7	27.5	26.0	26.8	100
1965 - 1969	76,311	71,170	147,481	175,029	103,835	114,611	540,956
%	51.7	48.3	27.2	32.4	19.2	21.2	100
1970 - 1974	150,082	216,129	366,211	391,000	219,268	283,000	1,259,479
%	41.0	59.0	29.1	31.0	17.4	22.5	100
1959 - 1974	325,068	321,332	646,400	720,522	522,915	668,029	2,557,866
%	50.3	49.7	25.3	28.2	20.4	26.1	100
1975 - 1977			865,377	2,123,000	760,100	769,245	4,517,722
%			19.2	47.0	16.8	17.0	100
1951 - 1977			1,687,606	2,914,691	1,423,625	1,547,758	7,573,680
%			22.3	38.5	18.8	20.4	100

Sources : 1. Shammem, A.A. and Al-Waeth, A. (1972) : Follow-up Report on the Economic Plans Fulfilment in Iraq between 1951 - 74, Ministry of Planning, Baghdad, Iraq, (in Arabic)

2. Saman, B.B. (1975) : The Reality of Agricultural Planning in Iraq, Min. of Planning, Baghdad, Iraq, (in Arabic)

3. Ministry of Planning, Annual Abstract, 1976, Baghdad, Iraq.

Table 3.3 Actual Government Expenditure in the Economic Development Plans and Programmes, 1951-1975

(Thousand I.D.)

Economic sector / Development programmes	Agriculture: Reservoirs, Irrigation, Drainage	Agriculture: Agricultural Services	Agriculture: Total	Industry	Transport and Communication	Building and Services	Total
1951 - 1954	16,646	2,708	19,354	2,587	10,402	10,856	43,199
%	*86.0*	*14.0*	*44.8*	*6.0*	*24.1*	*25.1*	*100*
1955 - 1959	54,910	5,401	60,311	32,265	57,171	72,463	222,210
%	*91.0*	*9.0*	*27.2*	*14.5*	*25.7*	*32.6*	*100*
1951 - 1959	71,556	8,109	79,665	34,852	67,573	83,319	265,409
%	*89.8*	*10.2*	*30.0*	*13.1*	*25.5*	*31.4*	*100*
1959 - 1961	16,805	3,832	20,637	11,782	21,132	46,860	100,411
%	*81.4*	*18.6*	*20.6*	*11.7*	*21.0*	*46.7*	*100*
1961 - 1964	12,736	7,171	19,907	38,315	55,082	87,037	200,341
%	*64.0*	*36.0*	*9.9*	*19.1*	*27.5*	*43.5*	*100*
1965 - 1969	31,140	25,130	56,270	103,894	61,158	66,313	287,635
%	*55.3*	*44.7*	*19.6*	*36.1*	*21.3*	*23.0*	*100*
1970 - 1974			208,473	329,709	177,440	171,311	886,933
%			*23.5*	*37.2*	*20.0*	*19.3*	*100*
1959 - 1974			305,287	483,700	314,812	371,521	1,475,320
%			*20.7*	*32.8*	*21.3*	*25.2*	*100*
1975			99,903	290,175	138,024	101,056	629,158
%			*15.9*	*46.1*	*21.9*	*16.1*	*100*
1951 - 1975			484,855	808,727	520,409	555,896	2,369,887
%			*20.5*	*34.1*	*22.0*	*23.4*	*100*

Sources : As in Table 3.2

Table 3.4 — Expenditure Efficiency of the Economic Development Plans and Programmes (Expenditure as % of Allocation)

Economic Sector / Development Programmes	Agriculture %			Industry %	Transport and Communication %	Building and Services %	Total %
	Reservoirs, Irrigation, Drainage	Agricultural Services	Total				
1951 - 1954	50.57	42.98	49.35	18.41	55.50	68.16	49.13
1955 - 1959	43.66	49.73	44.15	56.49	49.91	76.64	54.18
1951 - 1959	45.10	47.26	45.31	48.97	48.06	75.42	53.29
1959 - 1961	47.61	37.50	45.34	35.94	24.91	30.81	31.85
1961 - 1964	20.10	30.11	22.83	31.48	47.91	73.55	45.31
1965 - 1969	40.81	35.31	38.15	59.36	58.90	57.86	53.17
1970 - 1974			56.93	84.32	80.92	60.53	70.42
1959 - 1974			47.23	67.13	60.20	55.62	57.68
1975			48.15	64.77	83.15	53.75	62.32
1951 - 1975			47.09	65.24	62.74	57.52	58.29

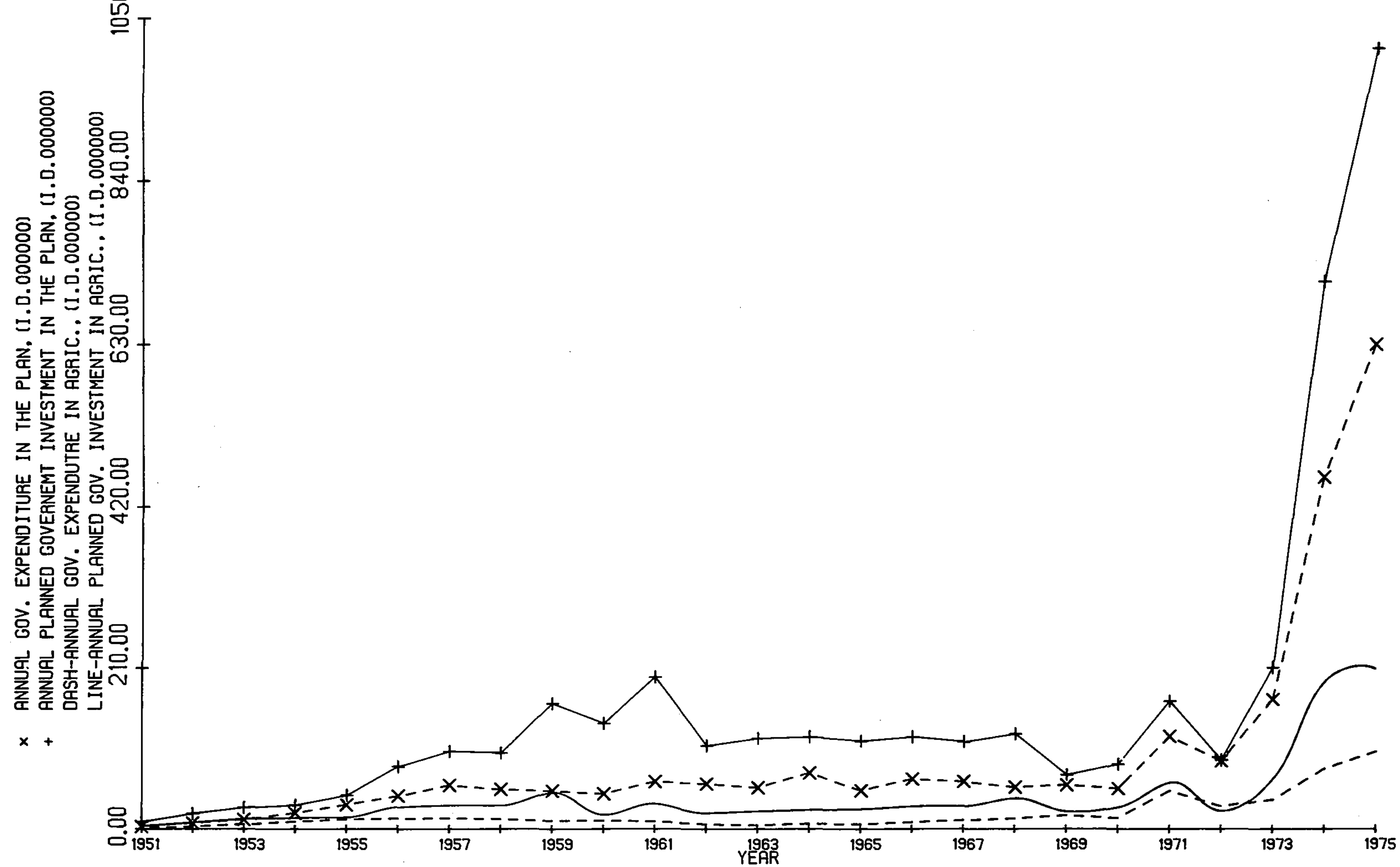
Sources : Calculated from Tables 3.2, 3.3 .

projects on increasing agricultural production in the irrigation areas was very small, especially on grain production as we will see later.(51)

During the 1959-74 period and onwards, more emphasis was put on industrial development.(52) Although both the planned government investment and the actual expenditure in agriculture increased during this period, these increases were not enough to allow take-off in agricultural development to match other economic sectors, especially industry. For example, in the 1965-69 development plan, the combined growth rate of the industrial sector was 7.0 per cent, whilst the agricultural sector grew by 4.7 per cent and both of these growth rates were below the planned rate.(53) This point is discussed in more detail below. In fact, more investment was required to push agricultural development to balance the growth of all economic sectors. Increasing agricultural investment was especially needed to cover the cost of the land reform implementation, irrigation and drainage projects, land reclamation, mechanization, the cooperative movement and agricultural services generally. Generally speaking, it seems that investment was below the required level. For example, the total cost of needed irrigation and drainage projects was estimated at I.D.379,965 thousand. Only 20 per cent of this total cost was met by allocations during the 1970-74 plan, this following a period when only 8.0 per cent was actually spent.(54) This low investment may be found in other agricultural activities. Fig. 3.1 shows the annual planned government investment and actual expenditure in all economic sectors and in the agricultural sector itself. As for the annual planned government investment, actual expenditure and expenditure efficiency, see Appendix A, Tables A.1, A.2, A.3, A.4 and A.5 for details.

Secondly, actual expenditure was very much below planned investment during the period between 1951-1975. This probably means that none of the development plans during this period achieved its planned target. Table 3.4 shows that expenditure efficiency was at the lowest level in the agricultural sector

FIG. 3.1 ANNUAL GOV. PLANNED & ACTUAL INVEST., NATIONAL & AGRIC., 1951-75



and at its highest in industry during this period. Table 3.5 ranks all economic sectors according to planned government investment, actual expenditure and expenditure efficiency for each development plan. It is obvious that agriculture was the worst sector, not only in terms of a low level of investment, but also in expenditure efficiency. Failures in development planning implementation could be related to several factors.[55,56] First, lack of political stability which affected the continuation of planning programmes and their targets.[57] Second, the lack of a statistical data base, which is the backbone of any economic development, especially in a centralised planning system.[58] Third, poor management, lack of coordination between government offices and government bureaucracy.[59,60] Fourth, most of the contracts were held with foreign companies which means that fulfilment of these contracts was subject to factors out of the control of the Iraqi government. Many contracts were also divided into a multitude of sub-contracts and that might delay the implementation of the plan.[61] Fifth, and perhaps one of the main reasons of poor performance in the agricultural sector, is the poor mobilization of the people involved in this sector, as for example, the lack of incentive schemes to the private sector which until recently dominated all agricultural activities. Recently, the government has encouraged the private sector by e.g. providing credit and loans to buy farm machinery under close supervision.[62] Nonetheless, it may take time to build up confidence between the private sector and the government after a series of setbacks. In the case of the public sector, state and collective farm productivity is not high, as we will see later. The last point concerning poor mobilization of the masses is the lack of coordination between the economic planners and the masses in agriculture to reflect the latter's requirements.[63] The government states that good cooperation from the bottom to the high level is essential in the development planning, but whether this policy is practiced or not it is a different matter.[64] Sixth, the low expenditure efficiency could be related to over estimated projected costs of the projects listed in the

Table 3.5 Economic Sectors Ranked According to Allocating Actual Expenditure and Expenditure Efficiency

	1951 - 54			1955 - 59			1951 - 61			1961 - 64		
Economic Sectors	Allocation	Expenditure	Expenditure efficiency	Allocation	Expenditure	Expenditure efficiency	Allocation	Expenditure	Expenditure efficiency	Allocation	Expenditure	Expenditure efficiency
Agriculture	1	1	3	1	2	4	3	3	1	4	4	4
Industry	4	4	4	4	4	2	4	4	2	1	3	3
Transport and communication	2	3	2	2	3	3	2	2	4	3	2	2
Building and services	3	2	1	3	1	1	1	1	3	2	1	1

	1965 - 69			1970 - 74 .			1975			The Whole Period (1951 - 1975)		
Economic Sectors	Allocation	Expenditure	Expenditure efficiency	Allocation	Expenditure	Expenditure efficiency	Allocation*	Expenditure	Expenditure efficiency	Allocation*	Expenditure	Expenditure efficiency
Agriculture	2	4	4	2	2	4	2	4	4	2	4	4
Industry	1	1	1	1	1	1	1	1	2	1	1	1
Transport and communication	4	3	2	4	3	2	4	2	1	4	3	2
Building and services	3	2	3	3	4	3	3	3	3	3	2	3

* Data available until 1977

Sources : Compiled from Tables 3.3, 3.4 and 3.5

development plan.

As noted earlier, the institutional and organizational reasons for low performance have also to be placed within the context of considerable physical environmental difficulties and constraints, which, as we shall see later, becomes more and more relevant to the approach of this thesis.

3.8 The Importance of the Agricultural Sector to the Economy of Iraq

The agricultural sector is still a very important sector to the economy of Iraq for three main reasons : first, the number of people engaged in agricultural activity. Until recently, it was estimated that about 60 per cent of the population were engaged in agriculture (see page 32). Secondly, the contribution of the agricultural sector to the national income. Thirdly, the importance of the agricultural sector to foreign trade. In this section, an attempt will be made to assess the importance of the agricultural sector in Iraq by looking at its contribution to the national income and trade.

3.8.1 The contribution of Agriculture to the National Income

Most developing countries are primary producing countries, in other words a large proportion of their national incomes are generated by agriculture.(65) If oil revenue is excluded from the Iraqi national income, this argument can be applied to Iraq as well. Table 3.6 shows the distribution of the GDP between the economic sectors between 1953 and 1975. It is clear from this table that the contribution of the agricultural sector to the GDP increased from I.D. 71.50 million in 1953, to I.D. 297.3 million in 1975 at current prices. This contribution, however, fluctuated annually for example in 1955, 1959 and 1963 (See Table 3.7), such fluctuation mainly caused by weather and other physical environmental problems such as floods.(66) In spite of that, the combined growth rate of the GDP in agriculture at current prices was 6.7 per cent during the 1953 and 1975 period, compared with 11.9 per cent combined rate growth in the GDP including oil, and these rates would be lower still if constant prices were used. The low absolute rate of growth in agriculture probably reflects the failure of previous development policies to achieve higher expenditure efficiency in this sector, or in other words, a low level of effective investment. Table 3.7 shows that the proportion of the GDP generated in agriculture declined from 22.14 per cent in 1953 to only 7.49 per cent in 1975. This decline was mainly due to the increase in oil revenue during this period, especially in 1974 and 1975. It has probably declined even further more recently if we consider the increase in oil revenue after 1974.

Excluding oil revenue from the GDP will reveal that the highest proportion of the GDP was generated by agriculture. Table 3.8 shows that 37.02 per cent of the GDP was generated in agriculture in 1953 and declined to only 17.67 per cent in 1975 (excluding oil). This decline was mainly due to the development of other economic sectors.

As the result of low growth in the agriculture sector, which was probably accompanied by a continuous increase in the rural population, one may anticipate that there was a difference in per capita income between rural and urban populations.[67,68] Table 3.9 shows the income distribution between the agricultural and non-agricultural population in Iraq between 1953 and 1971. This table not only indicates that there was a difference between the agricultural and non-agricultural population's income, but also that the difference was growing. Low agricultural incomes may come as a result of several factors, such as low productivity or deliberate low price policies. Low investment, especially in improving land productivity, may cause low income. The second group of factors are discussed later in this chapter.

3.8.2 The Regional Distribution of the National Income

Recent information on the geographical distribution of the national income in general, and agricultural output in particular, is not available

Table (3.6). The Distribution of GDP According to Economic Sectors in Current Prices Between 1953 - 1975

I.D. Millions

Sectors	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Agriculture, forestry & fishing	71.50	84.72	65.33	89.23	111.57	92.76	82.01	97.84	116.98	140.38	109.30	133.3
Mining & quarrying	129.80	150.46	162.72	154.09	114.84	177.28	191.81	209.75	211.18	212.09	244.40	275.1
Manufacturing industry	19.74	21.88	26.92	32.07	35.25	36.79	44.83	54.40	59.51	65.08	64.20	63.7
Water & electricity	1.46	1.78	2.17	2.53	2.68	2.78	2.97	3.62	4.96	5.54	5.20	11.1
Construction & building	11.27	17.21	21.29	24.83	27.68	29.83	28.72	23.08	23.88	19.64	20.30	26.7
Total commodity sectors	233.77	276.05	278.43	302.75	292.02	339.44	350.34	388.69	416.51	442.73	443.40	509.9
Trans. communications & storage	21.37	22.06	24.56	27.55	29.92	30.61	34.29	39.72	45.95	47.02	48.80	45.5
Wholesale, retail trade, hotels and others	17.85	20.67	21.48	26.90	29.67	27.52	26.23	32.55	36.58	38.56	35.90	62.1
Banking, insurance and real estate agents	3.23	3.63	4.49	6.28	6.60	7.40	8.20	8.69	11.06	11.38	12.80	8.0
Total distribution sectors	42.45	46.36	50.53	60.73	66.19	65.53	68.72	80.96	93.59	96.96	97.50	115.6
Ownership of dwellings	11.61	11.91	12.20	12.47	12.80	12.51	11.58	11.89	12.13	12.45	12.40	29.2
Public administration & defence	18.29	20.80	24.34	28.12	32.06	37.57	45.65	45.71	51.46	59.76	67.40	85.4
Services	16.83	19.25	21.26	24.83	26.99	29.65	33.33	38.11	41.37	46.52	49.90	53.6
Building and Services Sector	46.73	51.96	57.80	65.42	71.85	79.73	90.56	95.71	104.96	118.73	129.70	168.2
Total	322.95	374.37	386.76	428.90	430.06	484.7	509.62	565.36	615.06	658.42	670.6	793.7

Sectors	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Agriculture, forestry & fishing	153.2	163.4	187.8	196.0	191.0	206.9	212.5	269.4	225.9	232.1	297.3
Mining and quarrying	285.9	304.2	270.6	341.0	343.3	370.5	512.9	407.3	574.3	2,030.7	2,287.7
Manufacturing industry	69.4	74.7	83.4	94.6	103.0	116.0	118.5	140.0	157.6	176.1	238.5
Water & electricity	12.0	12.6	12.8	14.9	16.8	17.8	11.9	13.7	16.0	13.7	17.7
Construction & building	30.5	34.5	32.8	36.8	38.5	40.6	43.6	45.2	57.6	69.1	91.3
Total commodity sectors	551.0	589.4	587.4	683.3	692.5	751.8	899.4	875.6	1,031.4	2,521.7	2,932.5
Trans.communications & storage	58.2	63.2	64.0	65.8	69.1	71.2	79.7	85.9	88.5	124.1	157.6
Wholesale, retail trade, hotels and others	69.8	74.7	79.7	86.9	90.1	98.6	94.4	102.6	115.2	168.9	194.9
Banking, insurance and real estate agents	9.5	12.4	12.3	13.1	15.5	18.6	20.6	20.0	20.5	44.2	60.2
Total distribution sectors	137.5	150.3	156.0	165.8	174.7	188.4	194.7	208.5	224.2	337.2	412.7
Ownership of dwellings	30.2	39.0	32.4	37.9	44.7	51.0	54.5	56.3	58.8	74.7	80.5
Public administration & defence	89.0	94.1	98.2	104.6	117.8	124.3	131.7	136.0	154.5	261.4	372.6
Services	59.9	65.2	67.9	75.4	80.0	86.9	94.7	112.4	118.6	152.7	172.2
Building and Services Sector	179.1	198.3	198.5	217.9	242.5	262.2	280.9	304.7	331.9	488.8	625.3
Total	867.6	938.0	941.9	1,067.0	1,109.7	1,202.4	1,375.0	1,388.8	1,587.5	3,347.7	3,970.5

Sources: 1. 1953-1963 : Al-Minowfi, A.A. & Al-Athath, K(Undated) Estimation of the National Income 1965-1969, Ministry of Planning, Baghdad, Iraq Table 1, p.7 in (Arabic)
2. 1964-1970 : Ministry of Planning (1975) : National Income in Iraq, 1964-71, Baghdad, Iraq, Table 1, pp.31-32, (in Arabic).
3. 1971-1975 : " " : Annual Abstracts of Statistics, 1971 - 1975, Baghdad, Iraq.

Table (3.7) The Percentage Distribution of the GDP According to Economic Sectors

Sectors	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Agriculture, forestry & fishing	22.14	22.63	16.89	20.80	25.94	19.14	16.09	17.31	19.02	21.32	16.30	16.80	17.66	17.42	19.94	18.37	17.21	17.20	15.45	19.40	14.23	6.93	7.49
Mining & Quarrying	40.19	40.19	42.07	35.93	26.70	36.57	37.64	37.10	34.33	32.21	36.45	34.66	32.95	32.43	28.73	31.96	30.94	30.81	37.34	29.33	36.17	60.66	57.62
Manufacturing industry	6.11	5.84	6.96	7.48	8.20	7.59	8.80	9.62	9.68	9.88	9.57	8.03	8.0	7.96	8.85	8.86	9.28	9.65	8.62	10.08	9.93	5.26	6.00
Water & electricity	0.45	0.48	0.56	0.59	0.62	0.57	0.58	0.64	0.81	0.84	0.77	1.40	1.38	1.34	1.36	1.40	1.51	1.48	0.87	0.99	1.01	0.41	0.45
Construction & building	3.49	4.60	5.51	5.79	6.44	6.15	5.63	4.08	3.88	2.98	3.03	3.36	3.52	3.68	3.48	3.45	3.47	3.38	3.17	3.25	3.63	2.06	2.30
Total commodity sectors	72.38%	73.74	71.99	70.59	67.90	70.02	68.74	68.75	67.72	67.23	66.12	64.25	63.51	62.83	62.36	64.04	62.41	62.52	65.41	63.05	64.97	75.32	73.86
Trans. commun. & storage	6.62	5.89	6.35	6.42	6.96	6.32	6.73	7.03	7.47	7.14	7.28	5.73	6.71	6.74	6.80	6.17	6.23	5.92	5.80	6.18	5.58	3.71	3.92
Wholesale, retail trade, hotels & others	5.53	5.52	5.56	6.27	6.90	5.68	5.15	5.76	5.95	5.86	5.35	7.82	8.04	7.96	8.46	8.14	8.12	8.20	6.86	7.39	7.26	5.05	4.91
Banking, Ins. & real estate agents	1.00	0.97	1.16	1.46	1.53	1.53	1.61	1.54	1.80	1.73	1.91	1.01	1.10	1.32	1.31	1.23	1.40	1.55	1.50	1.44	1.29	1.32	1.52
Total distribution sectors	13.15%	12.38	13.07	14.15	15.39	13.53	13.49	14.33	15.22	14.73	14.54	14.56	15.85	16.02	16.57	15.54	15.75	15.67	14.16	15.01	14.13	10.08	10.40
Ownership of dwellings	3.60	3.18	3.15	2.91	2.98	2.58	2.27	2.10	1.97	1.89	1.85	3.68	3.48	4.16	3.44	3.55	4.03	4.24	3.96	4.05	3.7	2.23	2.03
Public administration & defence	5.66	5.56	6.29	6.56	7.46	7.75	8.96	8.08	8.37	9.08	10.05	10.76	10.26	10.03	10.43	9.80	10.61	10.34	9.58	9.79	9.73	7.81	9.38
Services	5.21	5.14	5.50	5.79	6.27	6.12	6.54	6.74	6.72	7.07	7.44	6.75	6.90	6.95	7.2	7.07	7.20	7.23	6.89	8.10	7.47	4.56	4.33
Building and Services	14.47%	13.88	14.94	15.26	16.71	16.45	17.77	16.92	17.06	18.04	19.34	21.19	20.64	21.14	21.07	20.42	21.84	21.81	20.43	21.94	20.90	14.60	15.74

Source : Calculated from Table 3.7.

Table 3.8 Contribution of Agriculture to the GDP (%)

Year	Including oil	Excluding oil
1953	22.14	37.02
1954	22.63	37.84
1955	16.89	29.16
1956	20.8	32.47
1957	25.92	35.39
1958	19.14	30.17
1959	16.92	25.81
1960	17.31	27.51
1961	19.02	28.96
1962	21.32	31.45
1963	16.30	25.65
1964	16.80	25.70
1965	17.66	26.34
1966	17.42	25.80
1967	19.94	28.0
1968	18.37	27.0
1969	17.2	24.92
1970	17.21	24.87
1971	15.46	24.65
1972	19.40	27.45
1973	14.23	22.30
1974	6.93	17.62
1975	7.49	17.67

Source : Calculated from Table 3.7 .

Table 3.9 Average Per Capita Income in Agricultural and Non-Agricultural Sectors in Iraq*

(current price) I.D.

Periods / Income	Non Agricultural	Agricultural	Difference
1953 - 57	90.5	25.4	65.1
1958 - 63	109.8	30.4	79.4
1964 - 71	148.5	47.4	100.8

* Agricultural population is rural population less 10 per cent

Source : Al-Tu'ama, M.H. (1975) : Economic Development and Income Distribution in Iraq, Unpublished M.A. thesis, University of Baghdad, Iraq, Table 23 , p.156, (in Arabic).

at all. The only study of this kind was carried out by K. Haseeb for 1956.(69) He estimated the value added of agricultural activities as well as other economic activities for fourteen provinces and whilst the statistics are dated, the regional balance between agricultural systems has not changed fundamentally. Table 3.10 shows the distribution of the national income by provinces. Four points appear from this table. First, the Northern, Southern and Central regions produced respectively 35.1, 34.1 and 30.8 per cent of the total value added of the agricultural sector. Secondly, national income was dominated by agricultural output, except where other major economic activities existed, such as oil in Kirkuk and Basrah provinces. Thirdly, Nineveh contributed 14.4 per cent of the total agricultural value added, and Baghdad was in second place with 12.7 per cent. Fourthly, details in Table 3.10 reveal that 46.6 of the value added of the field crops was produced in the rainfed areas, whilst 34.6 per cent of the value added of livestock was also produced in this region. This is why we here suggest that the government must improve the utilization of agricultural resources in this region, especially if Iraq wants to be self-sufficient in field crops which are mainly wheat and barley (see Table 3.10). The Central region is the main producer of vegetables and fruit, whilst the Southern region is mainly producing livestock.

From the previous discussion we can summarize the following points. Firstly, the contribution of the agricultural sector to the national income or GDP has increased in actual value, but the percentage of its contribution to the national income including or excluding oil decreased. Secondly, this decline came as the result of more rapid development in other economic sectors, especially oil. Thirdly, the overall growth rate of the agricultural sector for the 1953-75 period was 6.7 per cent which was the lowest sectoral rate of growth. Fourthly, as a result of that, it seems to be that there was an increasing differential between per capita incomes of the agricultural and

Table (3.10) Regional Distribution of the National Income, 1956

(I D '000)

Economic Sectors / Province	Nine-vah	Arbil	Sulai-maniya	Kirkuk	Total Northern Region	Diala	Bagh-dad	Anbar	Kerb-ela	Babil	Total Central Region	Al-Qadis-iya	Wasit	Thi Qar	Maysan	Basrah	Total Southern Region	Grand Total
Agriculture																		
Field crops	4,966	2,947	1,392	3,411	12,716	2,156	2,000	764	35	1,774	6,729	1,992	2,483	1,474	1,883	13	7,845	27,290
Vegetables	1,293	281	281	703	2,558	506	5,648	309	141	1,223	7,827	703	1,419	618	646	281	3,667	14,052
Fruit and Dates	456	876	354	58	1,744	1,473	1,520	34	314	226	3,567	286	48	145	21	916	1,416	6,727
Livestock	5,515	2,464	2,732	2,282	12,993	2,057	1,462	1,039	407	3,351	8,316	3,233	1,936	4,207	5,124	1,780	16,280	37,589
Forestry	432	319	133	-	884	24	-	-	-	-	24	47	24	59	59	24	213	1,121
Fishing	4	-	-	-	4	2	534	2	60	74	672	117	11	140	76	270	614	1,290
Total agriculture	12,666	6,887	4,892	6,454	30,899	6,218	11,164	2,148	957	6,648	27,135	6,378	5,921	6,643	7,809	3,284	30,035	88,069
Remaining sectors	20,737	3,921	6,791	80,191	111,640	6,031	90,594	24,979	5,745	6,727	134,076	6,202	3,541	3,223	3,424	52,946	69,336	315,052
Income to abroad	-2,390	-	-	-34,770	-37,160	-	-1,345	-9,626	-	-	-10,971	-	-	-	-	-17,358	-17,358	-65,489
National income	31,013	10,808	11,683	51,875	105,379	12,249	100,413	17,501	6,702	13,375	150,240	12,580	9,462	9,866	11,233	38,872	82,013	337,632
Profit from oil companies	-2,390	-	-	-34,770	-37,160	-	-4,715	-9,626	-	-	-14,341	-	-	-	-	-17,358	-17,358	-68,859
National income (ex.profit from oil companies	28,623	10,808	11,683	17,105	68,219	12,249	95,698	7,875	6,702	13,375	135,899	12,580	9,462	9,866	11,233	21,514	64,655	268,773

Source : Haseeb, K. (1964) : The National Income of Iraq 1953 - 1961
Oxford University Press, London, table 107, p.179.

non-agricultural population. Fifthly, the rainfed area is particularly important in its contribution to the total agricultural value added.

3.8.3 The Contribution of Agriculture to Trade

Agriculture may make a significant contribution to foreign exchange earnings through displacement of current and potential imports and through expanded exports.[70] Most developing countries produce primary goods of agricultural or mineral origin, such as oil. Consequently, a limited number of such products are the major sources of foreign exchange.[71] As far as Iraq is concerned, exports to a large extent depend upon two main products; oil and agricultural products.

3.8.3.a The Value of the Exported Agricultural Products

Generally speaking, the value of exported agricultural products has fluctuated annually. This fluctuation is subject to many factors concerning the conditions inside and outside the exporting country. Table 3.11 shows the value of Iraqi exported agricultural products between 1950 and 1977. It is clear from this table that the value of exported agricultural products declined from I.D. 19,575 thousand in 1950 to I.D. 7,051 thousand in 1960 at current prices. Most of the decline in this period occurred in foodstuffs which includes mainly grain and dates as well as other less important products, for example fruit and vegetables. Meanwhile, the export of agricultural raw materials which showed a continuous improvement between 1950 and 1959, declined suddenly in 1960 and 1961. The declining value of exported agricultural products could be attributed to many factors: first, increasing local demand for agricultural products, especially foodstuffs. Secondly, we have already seen that there were no real efforts to improve agricultural productivity (page 60). Thirdly, weather was another factor which caused fluctuations or drops in exports in some individual years.[72] Fourthly, there were low prices for exports caused by increasing competition, especially if the poor quality of most agricultural products is

Table (3.11)

Value of Iraqi Export Products Between 1950 - 1977

I.D. thousand (current price)

Items \ Years	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Foodstuffs	16,089	20,929	14,253	14,015	13,580	11,483	7,861	6,809	8,238	4,985	4,093	4,045	14,906	10,307
Raw materials	2,995	4,979	3,084	2,591	2,178	3,151	3,879	3,974	4,342	5,151	2,940	2,933	3,700	4,579
Livestock	491	527	880	1,584	1,563	421	430	416	637	56	18	78	77	39
Manufactured goods	190	190	123	591	407	174	604	1,195	860	1,017	750	833	717	1,482
Agricultural exports	19,575	26,435	18,217	18,190	17,321	15,055	12,170	11,199	13,217	10,192	7,051	7,056	18,683	14,925
Exports, excluding oil	19,765	26,625	18,340	18,781	17,728	15,229	12,774	12,394	14,077	11,209	7,801	7,889	19,400	16,407
Oil Exports								113,160	185,540	201,700	222,650	223,170	223,870	259,070
Total Exports, including oil								125,554	199,617	212,909	230,451	231,059	243,270	275,477

Items \ Years	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Foodstuffs	6,955	8,508	10,729	7,508	7,455	9,827	10,807	8,772	12,929	15,540	10,389	13,155	14,256	13,962
Raw materials	5,552	5,653	6,492	5,114	5,489	5,669	5,285	4,711	4,473	6,483	5,118	4,086	4,482	6,125
Livestock	46	51	49	52	60	35	28	22	58	26	23	13	22	41
Manufactured goods	2,012	2,610	4,084	5,787	5,814	6,471	6,446	9,227	11,154	10,474	12,599	18,345	27,783	22,544
Agricultural exports	12,553	14,212	17,270	12,674	13,004	15,531	16,120	13,505	17,460	22,049	15,530	17,254	18,760	20,128
Exports, excluding oil	14,565	16,822	21,354	18,461	18,818	22,002	22,566	22,732	28,614	32,523	28,129	35,599	46,543	42,672
Oil Exports	282,040	294,220	309,770	271,948	345,006	347,384	367,622	523,191						
Total Exports, including oil	296,605	311,042	331,124	290,409	363,824	369,386	390,188	545,923						

Sources : Ministry of Economics: Annual Abstracts of Statistics, 1950-58, Baghdad, Iraq.

" " Planning " " " 1959-77, " "

considered.[73] This competition comes mainly from developed countries such as the U.S.A. and Canada.[74] Fifthly, international crises such as the closing of the Suez canal in 1956 which resulted in a large quantity of unsold barley in Iraq.[75] Sixthly, the implementation of the land reform law of 1958 can partly be blamed for a decline in the value of exported agricultural products, particularly between 1959 and 1961. Again, as we shall see later, some dislocation in production followed the major 1958 reorganization.

Nonetheless, in 1962 the value of exported agricultural products showed a very significant increase by nearly I.D. 1,164 thousand or by an increase of 165 per cent from the previous year. This growth was contributed mainly by an increase in food production, namely, wheat and barley, such an increase due to favourable weather conditions in that year. From 1962 onwards, agricultural exports, especially of foodstuffs did not show steady improvement. On the contrary, they fluctuated from one year to another as can be seen in Table 3.12 and Fig. 3.2. In addition, the value of exported agricultural products was losing its importance relative to total exports, excluding oil. Table 3.13 shows that 99 per cent of the total export was from agriculture in 1950. This percentage continuously declined until it reached 47 per cent of total export in 1977. This decline was contributed to by the increase of exporting other manufactured goods as well as to other factors mentioned earlier.

3.8.3.b The Main Exported Agricultural Products

The value of exported agricultural products in Table 3.11 are classified in three main groups: first, foodstuffs which include mainly grain, dates, fruit, vegetables and other products. Secondly, agricultural raw materials which include wool, cotton, oil seeds, hides and skins and other products, and thirdly, livestock which includes exported live animals.

Table 3.12 Changes in the Indexed Value of Agricultural Exports 1950 - 1977

Year	Index number	Year	Index number
1950	100.0	1964	64.13
1951	135.05	1965	72.60
1952	93.06	1966	88.22
1953	92.92	1967	64.75
1954	88.49	1968	66.43
1955	76.91	1969	79.34
1956	62.17	1970	82.35
1957	57.21	1971	68.99
1958	67.52	1972	89.20
1959	52.07	1973	112.64
1960	36.02	1974	79.34
1961	36.04	1975	88.14
1962	95.44	1976	95.84
1963	76.25	1977	102.83

Source : Calculated from Table 3.11

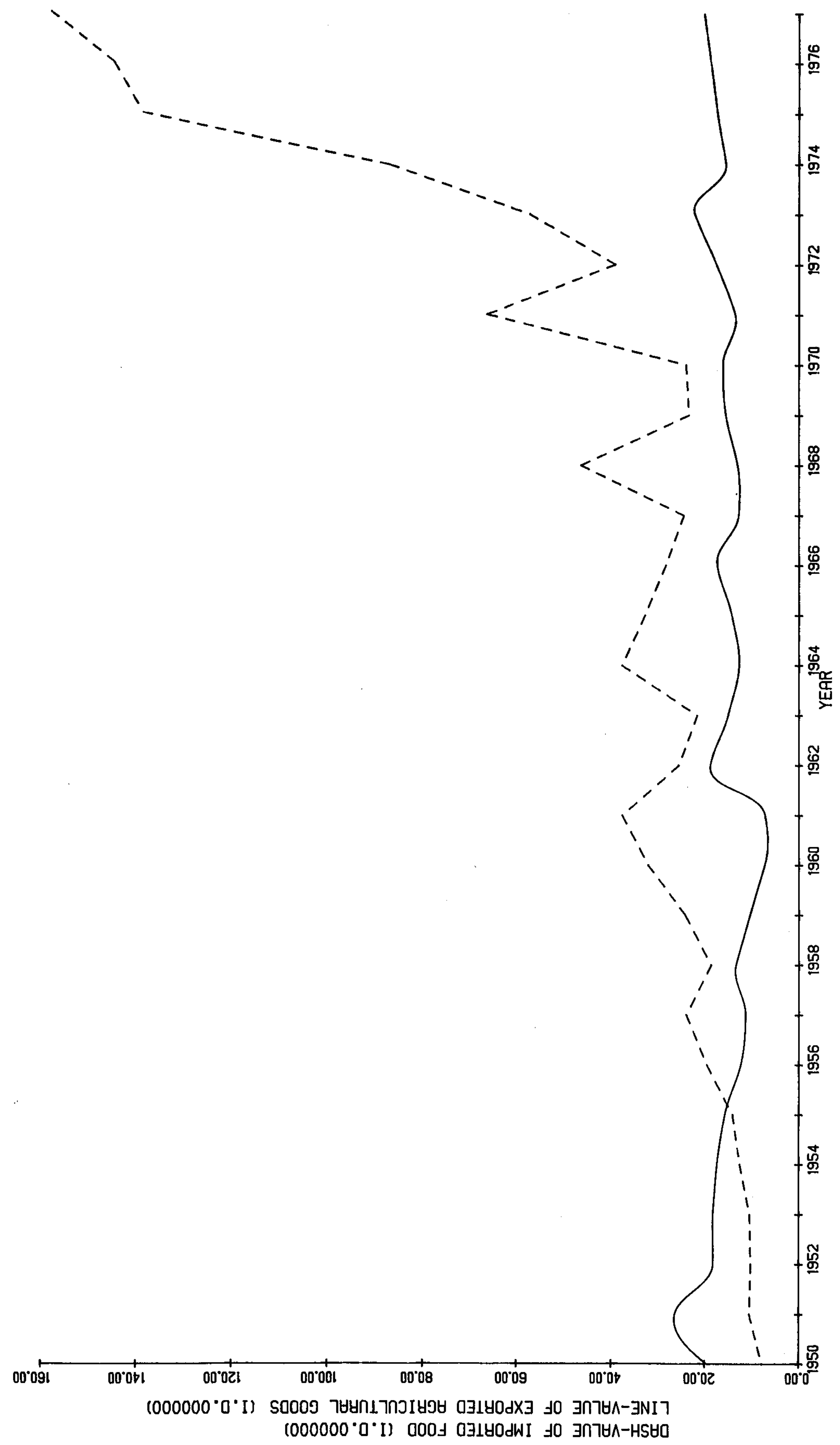


FIG. 3.2 ANNUAL FOOD IMPORTS & AGRICULTURAL EXPORTS, 1950-77

Table 3.13 Value of Agricultural Exports as a Percentage of Total Export (Excluding oil)

Year	%	Year	%
1950	99.04	1964	86.19
1951	99.29	1965	84.48
1952	99.33	1966	80.87
1953	96.85	1967	68.65
1954	97.70	1968	69.10
1955	98.86	1969	70.59
1956	95.27	1970	71.44
1957	90.36	1971	59.41
1958	93.89	1972	61.02
1959	90.92	1973	67.80
1960	90.38	1974	55.21
1961	89.44	1975	48.47
1962	96.30	1976	40.31
1963	90.96	1977	47.17

Source : Calculated from Table 3.11

Generally speaking, dates were the major exported commodity throughout this period. This is because Iraq is a major producer of dates and there was a government policy of linking imports with dates exports, a policy meant to help secure date exports. Barley was another major exported product until 1958, and because of the deterioration in agricultural production, barley was not exported continuously. Gram and sesame were in the same situation as barley. Wheat and rice were exported occasionally if the season was good. Fruit and vegetables were also exported in spite of the increasing demand from the domestic market. Hides, skins and wool were the most important items in exported agricultural raw materials.

3.8.3.c Food Imports

Food imports have been continuously increasing and probably will continue to increase in the foreseeable future if agricultural conditions in Iraq remain unchanged. The value of imported agricultural raw materials, such as cotton, has also increased because of declining production and expanding industry which depends on such materials or, both. Table 3.14 shows the value of imported food between 1950 and 1977. It is clear from this table that the value of imported food increased from I.D.7,780 thousand in 1950 to I.D. 157,065 thousand in 1977 (See Fig. 3.2). In other words, the value of imported food in 1977 was twenty fold higher than in 1950. Nonetheless, the percentage value of imported food to the total imports dropped from 20.7 per cent in 1950 to only 13.6 per cent in 1977 (See Table 3.15). This decline was mainly due to the increase in total imports from I.D. 37,600 thousand in 1950 to I.D. 1,151,300 thousand in 1977.

The value of imported food grew at a combined rate of 11.7 per cent at current prices annually between 1950 and 1977, and it may have grown faster from 1974 onwards. Table 3.16 shows the index value of imports which reveals a large increase in the value of imported food from 1974 onwards. Some of the factors which affected the decline in the value of

Table 3.14 The Value of Imported Food* and Total Imports by Iraq, 1950 - 1977

(I.D. Thousand)

Year	Imported foods	Total imports	Year	Imported foods	Total imports
1950	7,780	37,600	1964	37,520	147,450
1951	10,446	50,960	1965	32,680	162,610
1952	10,210	61,850	1966	28,250	176,090
1953	10,400	68,400	1967	24,400	151,200
1954	12,500	72,700	1968	26,200	144,500
1955	13,980	97,160	1969	23,300	155,900
1956	19,500	113,440	1970	23,900	179,400
1957	23,900	121,780	1971	65,800	245,200
1958	18,560	109,800	1972	38,880	234,700
1959	24,100	116,400	1973	56,900	270,300
1960	32,000	138,950	1974	186,599	700,100
1961	37,500	145,590	1975	137,954	1,044,700
1962	25,500	129,750	1976	143,875	1,024,700
1963	21,600	113,990	1977	157,065	1,151,300

* Including beverages and tobacco.

Sources:
1. 1950-54: The Annual Reports of the National Bank of Iraq, Baghdad, Iraq.
2. 1955-56: The Statistical Abstract of 1955 and 1956.
3. 1957-71: Series of Annual Reports of the Central Bank of Iraq.
4. 1972-1977: The Statistical Abstracts of 1972-77.

Table 3.15 Value of Imported Food as a Percentage of Total Imports 1950-1977

Year	%	Year	%
1950	20.7	1964	25.5
1951	20.5	1965	20.1
1952	16.5	1966	16.04
1953	15.2	1967	16.14
1954	17.2	1968	18.13
1955	14.4	1969	14.9
1956	17.2	1970	13.3
1957	19.6	1971	26.8
1958	16.9	1972	16.6
1959	20.7	1973	21.1
1960	23.03	1974	26.7
1961	25.8	1975	13.2
1962	19.7	1976	14.04
1963	18.9	1977	13.6

Source : Calculated from Table 3.14

Table 3.16 Changes in the Indexed Value of Imported Food and Total Imports 1950 - 1977

Year	Imported foods	Total imports	Year	Imported foods	Total imports
1950	100.0	100.0	1964	482.3	392.2
1951	134.2	135.5	1965	420.0	432.5
1952	131.2	164.5	1966	363.1	468.3
1953	133.7	181.9	1967	313.6	402.1
1954	160.7	193.4	1968	336.8	384.3
1955	179.7	285.4	1969	299.5	414.6
1956	250.6	301.7	1970	307.2	477.1
1957	307.2	323.9	1971	845.8	652.1
1958	238.6	292.0	1972	499.7	624.2
1959	309.8	309.6	1973	731.4	718.9
1960	411.3	369.5	1974	2398.5	1862.0
1961	482.0	387.2	1975	1772.5	2778.5
1962	327.7	345.1	1976	1849.6	2725.3
1963	277.6	303.2	1977	2018.8	3062.0

Source : Calculated from Table 3.14

exported agricultural products, may also explain the increase in imported food (pages 72 and 74).

Up to 1959, sugar and tea dominated the list of imported foodstuffs by value - although other products were imported, for example, fruit, vegetables, coffee, dairy products, wheat and rice, the total value of such products was relatively small and fluctuated according to the domestic production. It seems, however, from 1959 onwards Iraq has started to import most of the food it needed, especially wheat, rice, meat (including poultry), dairy products, fruit and vegetables.[76]

3.9 Prices, Pricing Policy and Marketing System

Generally speaking, it is not easy to divorce prices and pricing policy from the marketing system. Both pricing policy and the marketing system play a significant role in determining the prices which are paid for, or received by farmers on the one hand, and the prices which are paid by the consumers on the other. In this section we will attempt to review the prices received by farmers or paid by consumers. The prices of inputs are examined in later related chapters.

Before the 1958 revolution, prices of agricultural products were supposed to be fixed on a free market basis. Briefly speaking, the marketing system was primitively based on traditional and historical relationships between farmers and those who were involved in marketing agricultural products. Throughout the country there was a large number of middlemen, money lenders, merchants and rural shop keepers.[77, 78] Usually farmers received credit in kind or in cash in advance for their promises to sell all their products to the creditors. Most of agricultural products were sold in auctions. It has been argued that this form of traditional market was developed as a result of a shortage of agricultural credit and little government regulation. Consequently farmers were exploited by those who marketed agricultural products.[79,80] An F.A.O study reveals that consumers had to pay 400 per cent or more of the price that the producers had received.[81] Other studies confirm the large marginal profit made by middlemen.[82, 83] Table 3.17 shows examples of percentage differences between wholesale and retail prices of fruit and vegetables in Baghdad.

Many national agricultural price policies have deliberately kept prices of agricultural products down in order to transfer capital to cities for investment.[84] In the case of Iraq, it seems that capital in the private sector was not fully used for economic development, especially agricultural development.

Against this background, the government, following the 1958 revolution, gradually introduced certain measures to stabilize prices and improve the marketing institution in Iraq. Some of these measures briefly are:-[85]

1. The spread and support of agricultural cooperatives all over the country, especially in the land reform areas, to market products. Though the encouragement of cooperative marketing is now considered as one of the important policies, the significance of its effectiveness in national terms is not yet clear. But, without any doubt, its future contribution to marketing agricultural products will increase.

2. Creating institution and government organizations specialized in marketing agricultural products, such as the Grain Regulation Administration, Dates Administration, Fruit and Vegetable Marketing Administration, Food Products Trade ,etc. The main purposes of these organizations are buying, selling, distributing, importing and exporting foodstuffs.

3. A gradual restriction of the marketing of most main commodities to specialized cooperative societies and government organizations.

4. Fixing the prices of selling and buying for main agricultural products

Table 3.17 Percentage Differences Between Wholesale and Retail Prices in Baghdad 1973/74

Commodity	%
Squash	+101
Green pepper	+176
Green peas	+114
Potatoes (imported)	+ 80
Peas	+214
Apples	+127
Bananas	+203

Source : F.A.O. (1974) : Priorities in Agricultural Marketing Development, Rome, Italy, p.14.

to create rewarding prices for farmers on one hand, and to ensure suitable prices for consumers on the other.

5. Efforts to be made to improve rural transport, storage facilities and marketing centres.

Measures to improve the marketing system are left to the ministries concerned. As for pricing policy, the government created the Trade Regulating Board and the Central Pricing Authority in 1970 and 1974 respectively. Information on pricing agricultural products is too vague for a detailed discussion of both the private and public sectors. But, it seems most likely that prices are fixed on historical bases bearing in mind changes in the cost of production, agricultural conditions and seasonality for fruit and vegetables.(86, 87) In addition, it seems that these prices are fixed regardless of grades or quality for some agricultural products.

The degree of success of the recent government intervention in marketing and pricing agricultural products can be examined through the changes in prices in relation to changes in acreage and improving productivity. Considering the first point, study shows that prices of field crops and fruit and vegetables products increased by 9 and 13 per cent respectively between 1970 and 1978, whilst the cultivated area increased by only one per cent. (88) This means that the elasticity of these crops' acreages is very low, or in other words, farmers' response by increasing acreage is very low. This indicates that the price influence on land changes was generally very limited, but the low farmers' response could be related to the availability of other resources and alternative uses, rather than to differences in the intrinsic propensities of farmers to respond to price changes. (89) During this period, however, prices of major agricultural inputs such as fertilizers, seeds, plant protection and renting farm machinery were heavily subsidized by the government, as we will see later in other chapters. For example, the price of chemical fertilizers and insecticides was reduced by 30 and 50 per cent respectively from 1974. (90)

It is clear that there has been no significant relation between agricultural productivity and price increases.[91]

Summing up the foregoing discussion reveals that the government intervention was not fully successful in increasing acreage under cultivation or improving agricultural productivity significantly. There are many reasons for that, for example, land availability and soil conditions, technical factors, land tenure system, social factors, climatic factors, transport cost, etc., and some of these factors will be discussed in detail in the following chapters.

3.10 Future Agricultural Development

It is noticed from the previous section that agriculture suffered from low investment and expenditure efficiency in relation to other economic sectors, industry in particular. Moreover, the government since 1975 started its "Big Push" policy, and this policy seems more feasible in all economic sectors except agriculture. As the result of such a development policy, Iraq gradually becomes more dependent on imported food (see page 78). The question remains whether the government should go ahead with such policies or must reconsider its attitude towards agricultural development. We believe in the latter alternative for several reasons: firstly, industrialization of Iraq on a large scale, without doubt, will increase the demand for labour in general.[92] In addition, demand for labour will come from other economic sectors, such as transport and communication and building services. Growing demand for labour in these sectors means either more foreign workers, or more migration from the agricultural sector to meet such high demand. This will depend to a large extent upon the future government policy to foreign worker immigration. As for agriculture, the shortage of labour is already felt and will have a negative consequence on production, especially in unmodernized agriculture (see page 34).[93] The future settlement of foreign workers in Iraq will be very crucial and it will depend very much on political relations between Iraq and the country of their origin. Probably, also, unemployment might increase after the construction of industrial and infrastructure projects has achieved its optimum level.

Secondly, technical and managerial factors will be a crucial factor in the future and will create bottlenecks in managing these new industrial projects, although the government has adopted a programme to improve the managerial and technical personnel.(94,95) Consequently, this might affect production costs and maintaining production.

Thirdly, the "Big Push" policy which is obviously concentrated on industrial development might have negative consequences as the result of factors mentioned above. Experience in other countries suggests that such a policy will increase wastage, inflation, the choking of transport and communication facilities, shortages of raw materials; it appears that Iraq is already suffering from all these problems.(96,97)

Fourthly, reliance on imported food is rather risky in securing enough food in the short or longterm, and hence this is one of the reasons for agricultural development (see page 78). (98)

Devising an agricultural development policy, however, is not the objective of this thesis, but sketching a broad outline for such development is relevant to this thesis. The main points here are: first, agricultural development must be considered as a complex of many inter-related socio-economic and technical factors (see Fig. 1.1). The lack of one of these factors will have a negative consequence on agricultural development as a whole. The previous agricultural development policy in Iraq is a good example of that. Secondly, the government should give first priority to the development of rainfed areas to increase agricultural production, especially of staple winter crops like wheat and barley. The reasons for that are : (a) soil in the rainfed areas is relatively free from soil salinity (see pages 354-56); (b) Irrigation can be used as supplementary to secure production, whilst less intensive drainage systems are required; (c) Mechanization could be more efficiently used in the rainfed area because the size of the farms is larger (see page 316).

Thirdly, summer crops may be concentrated in the irrigated areas of the Central and Southern regions of Iraq because they require less land to achieve a desired production level. When the land is fully reclaimed from salinization and all the necessary facilities of irrigation and drainage are available, then the cultivation of winter and summer crops can be expanded.

Fourthly, livestock production can be encouraged in the irrigated areas, especially during and after land reclamation periods, when forages are very useful to improve soil structure. This policy could secure good incomes for the farmers during land reclamation periods.

Lastly, incentive programmes should be introduced to encourage private investment in agriculture to improve agricultural productivity. Such programmes could also be introduced in the public sector where low agricultural productivity exists.

3.11 Conclusion and Final Remarks

Until recently agriculture was very important to the economy of Iraq in terms of people engaged in it, and its contribution to the national income and to foreign trade. Agriculture has lost its predominant importance in the economy of Iraq as a result of rapid development of other economic sectors, oil in particular and, unfortunately, to the slow growth of agriculture itself.

In this chapter an attempt has been made to analyse economic development policy in general and agricultural development in particular between 1950 and 1977. Generally speaking, the progress of economic development in Iraq is classified into four stages; economic development with limited financial resources (1932-1950), economic development with unlimited financial resources (1950-59), development during 1959-74 with an increased but still low level of financing and finally development with a substantial increase in the financial resources. Economic development of Iraq is characterized by certain features, such as the domination of the public sector, frequent changes of government policy, the reliance on oil revenue to finance economic development and thus associated with financial uncertainty.

Development of the agricultural sector changed very frequently in emphasis. Between 1951 and 1959, the emphasis was on agricultural development in general and on engineering projects in particular, for example, dams, reservoirs and irrigation and drainage projects. Evidence available suggested that a large proportion of the planned government expenditure was spent on flood control projects and to a less extent on irrigation and drainage projects. The main purpose of such policies was to bring new production land into being rather than improving productivity on existing farmland. This policy becomes very clear if the type of agricultural investment is considered (see Table 3.2). After the 1958 revolution, the government development has changed towards social and industrial sectors and therefore gradually more emphasis was/is given to industry, especially after the 1973 oil price increases. Although, the planned government investment in agriculture increased absolutely during the 1959-74 period, the proportional share of agricultural investment to total investment during this period was lower than during the 1950-59 period. This may be regarded as a major set back for agriculture since an even greater increase in agricultural investment was particularly needed because of the greater government involvement in agriculture. The proportional decline in emphasis was out of phase with a major increase in the socio-political emphasis on agriculture and rural conditions as we shall see in our consideration of, for example, land reform.

Nonetheless, during the 1959-74 period, the type of agricultural development also changed, and agriculture services received more investment than in the previous period. This was contributed to by a decline in the number of engineering projects, and/or the result of direct government intervention through the implementation of the land reform law, establishing farm machinery renting stations, etc. In any case, however, the actual expenditure on agriculture was very low compared to expenditure on other economic sectors. In spite of the availability of financial resources during 1951-1974, the actual expenditure was below the planned government investment in all economic development plans and programmes. Low investment may be related to unstable government policy, lack of coordination between government departments, poor management and absence of a statistical data base. There are also other factors which may affect the poor performance of the agricultural sector, such as the lack of incentive schemes to the private sector, and low responsibility in the public sector.

This low investment in agriculture has had many negative consequences. The agricultural rate of growth was the lowest among all economic sectors during this period. This low rate of growth has affected the per capita income of agricultural people (See Table 3.9), and also has affected the value of exported agricultural products, and gradually Iraq becomes more and more dependent on imported food. Therefore, despite the increase in its contribution to the national income in real value, its proportion declined continuously because of the rapid development of other economic sectors, oil in particular and to the low growth of agriculture itself.(99)

A recent government attempt was made to encourage production by subsidizing many input factors, controlling the market for most of the agricultural products and fixing prices to ensure a good return for the farmers. These policies were not very successful either in increasing productivity or increasing the cultivated areas.(100) The farmers' response in increasing production or productivity was very small in relation to the advantages they received. This failure could be related to other socio-economic and technical factors, such as the land tenure system, land reform, irrigation and drainage facilities, soil conditions, climate, etc. Some of these factors will be discussed in detail in the following chapters.

In addition, a very broad agricultural development policy was suggested. This policy consists of giving top priority to the rainfed areas. Meanwhile efforts must be continued in the Central and Southern areas to reclaim land and establish good irrigation drainage facilities in these areas. During the period of land reclamation, farmers must be encouraged to produce summer crops and livestock; when the land is fully recovered, normal specialised farming with rotation system can be applied. In the following chapter we go on to consider, through a land resource inventory, some of the more detailed aspects of physical potential for agriculture.

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CHAPTER FOUR

LAND UTILIZATION

4.1 Introduction

Thomas Malthus in 1798 first drew attention to the tendency of people to increase in number at a geometric rate in contrast to the arithmetic rate of increase in food production. His pessimistic views were not realized in the past because of technological, economic and sociological changes as well as by the opening up of new agricultural areas in North America and Australia, and the gradual introduction of birth control mainly in developed countries.[1] His views have come to the fore recently as a result of renewed concern with population growth and food supply.[2] Generally speaking, land resources and land capability are primary factors controlling food supplies. Even though the F.A.O. has estimated that at least 3.2 billion hectares of arable land are available world-wide and only one-third of this land is actually harvested, there is continuing concern about future food supply in the world.[3, 4] Regional and national balances of supply and demand are equally important.

Land resources inventory is an important factor, particularly in agricultural economic development programmes. Economic investment in agriculture, land utilization, size of holdings, land tenure system, type and level of technology such as mechanization, irrigation and drainage projects are all affected profoundly by the land resources inventory in the country. We therefore must examine the inventory of land resources for agricultural uses in some detail and here under three heads :[5] first, land capability for agricultural production and how it is affected by geographical location and farming systems in the country; Secondly, population pressure on land, and, thirdly, the competition for land between agricultural and non-agricultural purposes.

The main tasks of this chapter are first, to explore the land resources inventory in Iraq (including actual land utilization and the distribution of utilized land into rainfed and irrigated areas); secondly, to examine changes in the rural population structure and their effects on land resources, and, finally, estimates of different types of man-land ratios in Iraq.

4.2 Land Resources Inventory: Aside from oil and water, land resources are the most important asset in Iraq. Land resources in any country, however, can be determined by the two main factors, water (rainfall and irrigation) and soil conditions. The quantity of the cultivable land, therefore, fluctuates according to the quality of land which is determined by the previous two factors, and by both the past and present ability of successive farmers to supplement deficiencies in natural conditions.

This last factor is particularly relevant in Iraq. Past experience suggests that this country was once capable of supporting perhaps three times the total present population, but that today such a capability has disappeared.(6)

It was already indicated in section 5 of Chapter Two that not all the Iraqi land is suitable or potentially suitable for cultivation (see page 22). Deserts, high barren mountains and marsh land must be excluded. Probably the areas suitable or potentially suitable for cultivation only exist in the foothills region, the valley plains of Lower Mesopotamia and finally valley basins scattered within the mountain region.(7) Even so, full utilization of these cultivable lands will still depend on human capability.

So far there is no accurate estimate of the total area suitable or potentially suitable for cultivation in Iraq. Estimates vary because they depend on many assumptions such as water availability and water storage capacity in the country, soil conditions, etc.[8] Some of these estimates will be reviewed in the following pages. For the purposes of this study terms are used with the following meanings:

Cultivable land : any land which according to the criteria adopted in particular land capability studies is regarded as suitable for permanent cultivation.

Agriculturally utilised land : any land which is used for different forms of cultivation and grazing.

Agricultural or farmland : land held in agricultural holdings.

Cultivated land : land which is regularly but not necessarily continuously used for crop growing, i.e. includes periodically fallow land.

Cropped area : land which during any one growing season actually carries crops, i.e. excludes land in fallow.

Irrigable land : land which, on the basis of physical criteria, is suitable for irrigated cultivation assuming the availability of water for irrigation.

The Department of Agriculture of the Ministry of Planning classified the cultivable or potentially cultivable land in Iraq into the following three categories without estimating the area of each category:-[9]

1) Utilized land not requiring any improvement.

2) Utilized land requiring partial improvement mainly in irrigation and drainage systems.

3) Land requiring large investment programmes to reduce salinization and the establishment of irrigation and drainage projects.

In 1931, Sir Ernest Dowson estimated the production area at 36.7 million donums of which 10.5 million donums fell in the rainfed zone and

20.2 millions in the irrigated area. This means that nearly 21 per cent of the total Iraqi land was then considered to be suitable for cultivation.(10) Dr. Buringh in 1960 estimated the cultivable land in Iraq at 48 million donums of which 32 million donums lay in the irrigated area and 16 million donums in the rainfed area.(11) In the economic development plan of 1965-69, the government accepted 40 million donums as the cultivable area in Iraq, of which 15 million donums was in the rainfed area with above 400 mm. precipitation and the rest in the irrigated area. (12, 13) Another recent estimate, however, suggested that the total cultivable land is about 56 million donums. (14) The disagreement of these estimates stems from the fact that there is no comprehensive land resources inventory survey in Iraq and from the different assumptions on which the existing estimates are made.

Since, however, the IBRD, Hashim, J., Warriner, D. and government officials have accepted 48 million donums as a reasonable estimate of the cultivable or potentially cultivable land in Iraq, these figures will be used for the purpose of this thesis. (15, 16, 17) The distribution of cultivable land into irrigated and rainfed area as 32 and 16 million donums will also be accepted. The question of fertility and how much land has been utilized will be discussed later in this chapter.

4.3 Classification of Land Productivity: Knowledge of land productivity is clearly integral to improving the management and output from existing farmland as well as for developing new areas.(18)

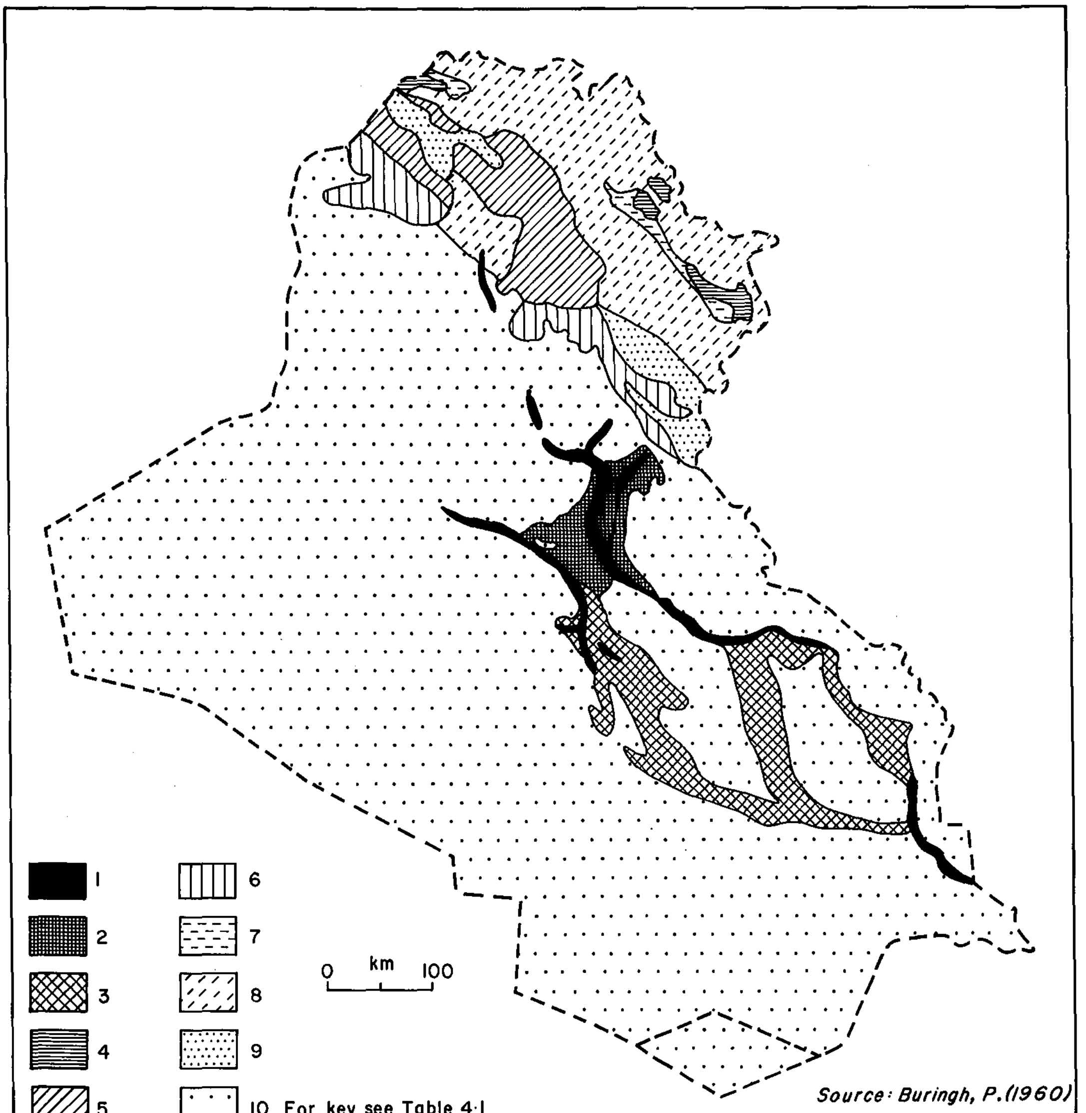
For example, planning of new arable land use requires information about the nutrient status of the soil so that appropriate types and quantity of fertilizers can be applied. Clearly knowing land productivity potential will have many economic and technical benefits, such as controlling the cost of production of an agricultural product, the cost of land reclamation, etc.(19) Comprehensive surveys of land productivity, however, are not available, except for some individual studies in certain project areas.[20,21] The only national study available was carried out by Buringh between 1955-58 when he classified soil suitability in Iraq under then conditions into ten categories as shown in Table 4.1 and Fig. 4.1.[22] As D.H. Davies pointed out various criticisms can be made of Buringh's classification.[23] Nonetheless, the orders of magnitude of the classed areas indicate, as shown in Table 4.1 that the sub-marginal land consists of 74 per cent of the total, and secondly, cultivable land in the rainfed area is estimated at 11.96 million donums, i.e. about 6.7 per cent of total Iraqi land. Thirdly, the cultivable land in the irrigated zones is estimated at 15.96 million donums or 9.7 per cent of total Iraqi land.

4.4 <u>Actual Land Utilization</u>: Cultivation in Iraq has been going on for many centuries, but data on land utilization, however, comes mainly from the agricultural censuses of 1952/53, 1958/59 and 1971.[24] Here we examine some individual estimates of land utilization.

Table 4.2 shows land utilization in Iraq according to each agricultural census. The first point to appear from these statistics is that land utilization in Iraq has not reached its maximum potential level (48 million donums). The largest area of utilized land, 30.3 million donums, was reported in the 1958/59 agricultural census. In the 1971 agricultural census, however, land under utilization was reduced to nearly 23 million donums. It is not easy to find out one single explanation for such a decline in land utilization between 1958/59 and 1971, but the most obvious reasons, probably, are the changes in agricultural conditions between 1958/59 and 1971, and the changing definition of utilized land in the agricultural censuses.

The most important feature of land utilization in Iraq is its domination by arable cultivation, especially of wheat and barley as we will see later. The percentage of arable utilized land according to 1952/53,

Fig. 4·1: GENERAL RELATIVE CLASSIFICATION OF SOIL SUITABILITY FOR PRESENT AGRICULTURAL USE



Source: Buringh, P.(1960) Soils and Soil Conditions in Iraq, Ministry of Agriculture, Baghdad, Iraq, p. 304

Table 4.1 Soil Suitability for Present Agricultural Use*

	Soil Class	Area** 1000 Sq.km.	Area Million Donums	%
1	Very good for irrigation farming	12.0	4.80	2.7
2	Good for irrigation farming	6.4	2.56	1.4
3	Fair for irrigation farming	21.5	8.60	4.8
4	Very good for dry farming	3.2	1.28	0.7
5	Good for dry farming	16.0	6.40	3.6
6	Fair for dry farming	10.7	4.28	2.4
7	Very good for grazing	2.1	0.84	0.5
8	Good for grazing	35.4	14.16	8.0
9	Fair for grazing	8.3	3.32	1.9
10	Sub-marginal soils	328.4	131.36	74.0
	Grand Total	444.0	177.6	100

* The total area suitable for agriculture is 46.24 million donums

** The total area of Iraq is larger in this Table than in Table 2.1 ,page 22.

Source : Buringh, P (1960) : Soils and Soil Conditions in Iraq, Ministry of Agriculture, Baghdad, Iraq, Table 3.7, page 305.

1958/59 and 1971 was 83.4, 96.5 and 84.6 respectively (these percentages include both fallow and cropped land). Table 4.2 reveals that 43.8 per cent of the arable land was left fallow in 1952/53 and 1958/59. Under the fallow system (Nairen System), half of the arable land must be left idle each alternate year, for reasons discussed later in Chapter Nine. From other evidence, one may safely assume that almost half of the arable land is left fallow each and every year.(25)

Permanent crops such as fruit and date palms occupy a small proportion of the total utilized land. Although the area under permanent crops decreased from 749,931 donums in 1958/59 to 605,998 in 1971, as a percentage of the utilized area it increased from 2.5 per cent in 1958/59 to 2.6 in 1971. This increase is mainly due to the drop in the total utilized area, especially in the arable area (see Table 4.2).

The area under permanent pastures declined from 923,465 donums in 1952/53 to only 157,198 donums in 1971. This decline is related to over-grazing which destroys permanent pastures, but also results from changing the definition of the pasture land in those censuses.

The area under forest also declined from 207,230 donums in 1952/53 to 43,200 in 1971 and it was reported below that in 1958/59. Again, this decline was probably due to over-utilization of the natural forest.

Summing up, we see that land utilization in Iraq is dominated by arable cultivation, whilst permanent crops, permanent pastures, and forest occupied a very small proportion. Fig. 4.2 shows land utilization in Iraq according to each census.

4.5 Regional Distribution of Land Utilization in Iraq

Regional distribution of land utilization reveals the effect of environmental conditions, especially climate, on land utilization. Table 4.3 shows the distribution of land utilization in the Northern, Central

Table 4.2 Land Utilization in Iraq

(DONUMS)

Kind of Utilization	1952/53		1959/59		1971	
	Area	%	Area	%	Area	%
Arable land	10,108,118	39.6	15,958,306	52.7	19,393,465	84.6
Fallow land	11,178,594	43.8	13,275,137	43.8	-	-
Permanent crops	512,651	2.0	749,931	2.5	605,998	2.6
Permanent pastures	923,465	3.6	239,754	0.79	157,198	0.7
Fodder crops	-	-	45,055	0.15	-	-
Forests	207,230	0.8	18,294	0.06	43,200	0.2
Land not suitable for cultivation	2,577,077	10.1	-		-	-
Other lands	-	-	-		2,726,876	11.9
Total	25,507,135	100	30,286,477	100	22,926,737	100

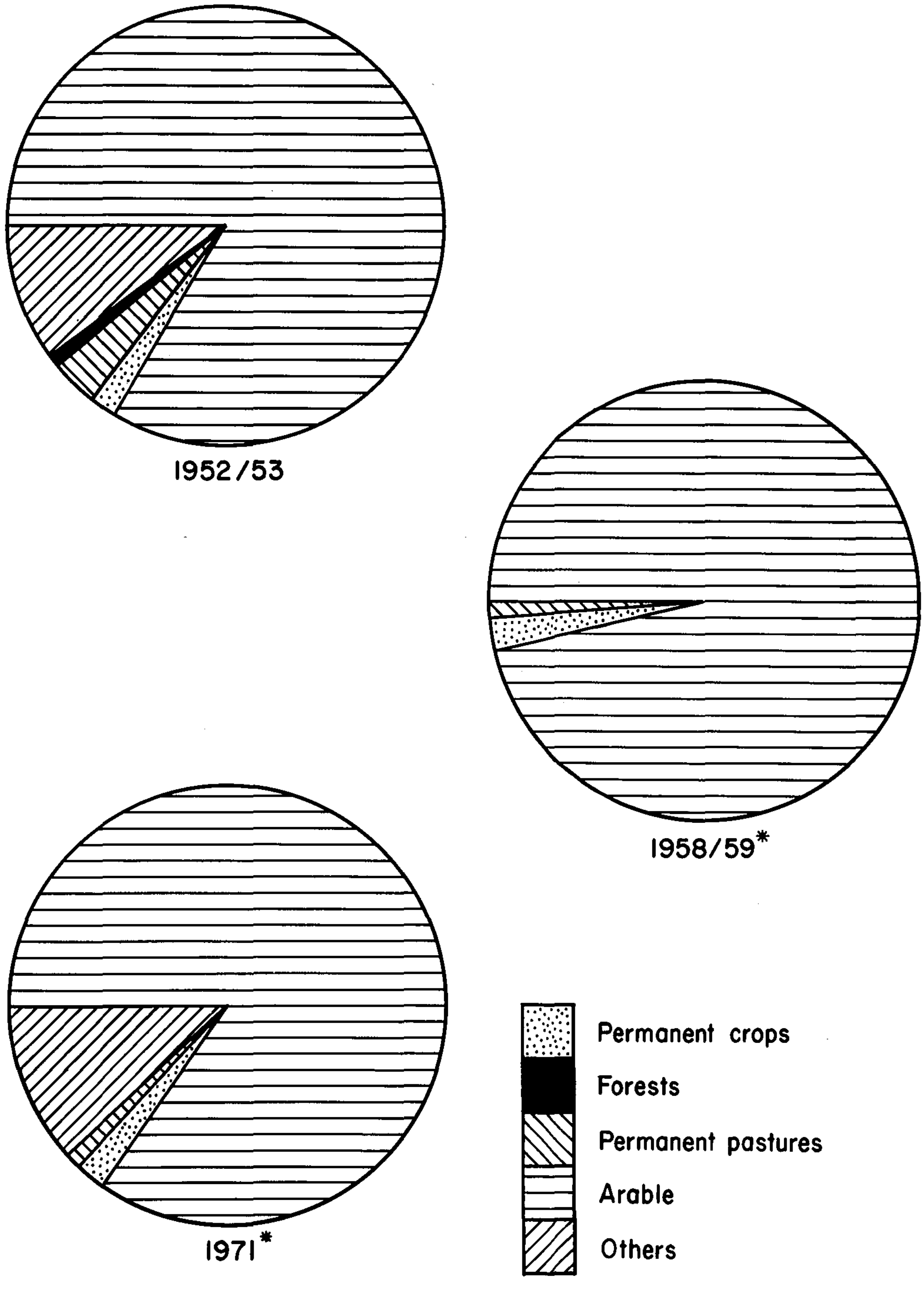
Sources: 1. Ministry of Economics(1954) : Report on the Agricultural and Livestock. Census of 1952/53, Baghdad, Iraq, Table 4 , page 10, (in Arabic).

2. Ministry of Planning (1961) : Results of the Agricultural and Livestock Census in Iraq for the year 1958-59, Baghdad, Iraq, Table 7 , page 10, (in Arabic).

3. Ministry of Planning (1973) : Results of 1971 Census of Agriculture, Baghdad, Iraq, Table 8 , page 36.

Note : For each of the years for which data are available and presented there are categories of land use which are only valid for that year. For example, "land not suitable for cultivation" in 1952/53 is nevertheless within a general class of land utilized in agriculture. Cross comparison must therefore be made only with considerable caution. No correction factors can be applied with certainty.

Fig 4·2 LAND UTILIZATION IN IRAQ



* Forest is included with the permanent pastures because of its small proportion

Based on Table 4·2

and Southern regions of Iraq for the 1958/59 and 1971 data. It is obvious from this table that over half of the cultivated arable land (fallow and cropped) is in the rainfed area. For example, in the 1958/59 agricultural census 45.2 per cent of the cropped arable land was in the Northern region, whilst only 23.6 and 31.2 per cent was in the Central and Southern regions respectively (see Appendix B, Tables B.1 and B.2 for provincial details of each region). In the case of the 1971 agricultural census, it was reported that 62 per cent of the cultivated arable land (fallow and cropped) was in the Northern region, whilst only 20.2 and 17.8 per cent was in the Central and Southern regions respectively (see Table 4.3). This high concentration of arable cultivation in the Northern area can be explained by the domination of winter grown cereal crops, namely wheat and barley (see Table 4.14). Moreover, since the Northern region is mainly in the rainfed area, as we shall see in Chapter 11, and since there is no summer rainfall here and irrigation water is not available on a large scale, summer cultivation is very limited in this region, with only a small area under fruit and summer vegetables. In the Central and Southern regions, however, the availability of irrigation water helps cultivation of some summer crops, such as rice, but not on the same scale as in winter (see Table 4.14).

Moreover, both the 1958/59 and 1971 agricultural censuses show that more than 80 per cent of the permanent crops such as fruit, citrus and palm-trees, are in the Central and Southern regions (see Table 4.3). Those crops require permanent water supplies which are rather difficult to obtain without irrigation, and relatively low winter temperatures in the north, as we will see in Chapter 11, inhibit those crops being grown in the Northern region.

Areas under forest are mainly found in the Northern region (see Table 4.3), associated with higher winter rainfall than in the semi-arid and arid Central and Southern regions. Permanent pasture, on the other hand, is found both in the Northern and Southern regions. In the Northern region, the availability of sufficient rainfall during winter can provide good permanent pastures, whilst in the Southern region, low productivity arid ranges tend to be classified as permanent pastures in spite of their low carrying capacity. Data on fodder crops, only provided by the 1958/59 agricultural census, shows the concentration of these crops in the Central region (see Table 4.3).

Probably the most obvious difference between actual land utilization (according to the 1958/59 and 1971 agricultural censuses), and soil suitability for agriculture, a classification of which was presented by Buringh in 1960, is that a large area of grazing land exists in the Central and Southern regions of Iraq and not only in the rainfed area as Buringh suggested. Fig. 4.3 shows the regional distribution of actual land utilization in Iraq in 1971.

Fig. 4.4 is a generalized map of land use in Iraq. As far as provincial land utilization is concerned, Appendix B, Tables B.1 and B.2 show such distribution in 1958/59 and 1971 respectively. It appears from these tables that Nineveh Province has the largest utilized land area and the largest proportion of its area is considered to be arable land, whilst Kerbela province has the smallest area of utilized land.

Description of farming practice in the rainfed area of Northern Iraq reveals the following points:-

1) In the Northern region in 1970-71, of the total utilized area of 12,429,845 donums, 12,024,975 donums were used for arable cultivation (land under crops and fallow). Such arable farming is dominated by growing of wheat and barley (96.7 per cent of the total utilized land)(see Appendix B,Table B.2 for details).

2) Wheat is grown entirely for human consumption, whilst barley is used for human food and livestock feed, mainly for the latter, although there are no data for the breakdown of consumption.

3) Cereal growers only rarely keep their own stock but may rent fallow land for grazing and may sell some barley to graziers. Grain is normally sold off-farm by growers to merchants (often loan creditors) in the private sector, or, if prices are advantageous to state purchasing agencies.

4) As considered later, the grower's choice between wheat and barley is affected by seasonal weather conditions and partly by prices (price effects are not analysed in detail in this study).

5) Wheat and barley growers utilize a simple sequence of arable and fallow, year in, year out (only about 50 per cent under crops). The land is left uncultivated during the fallow year and the farming season is as follows (see also page 457).

October - November -	First ploughing followed by second ploughing to prepare land for seeding.
November -	Sowing of winter wheat and barley,although barley may be sown up to the end of December. Sowing is usually carried out by hand (broadcast).
Mid-May -	Commencement of harvesting of earliest crops in favourable years; main harvest normally in June.

6) No weeding, harrowing, fertilising or other activities are carried out on the land between sowing and harvesting, except on some very exceptional farms.

4.6 The Distribution of Utilized Land into Rainfed and Irrigated Areas

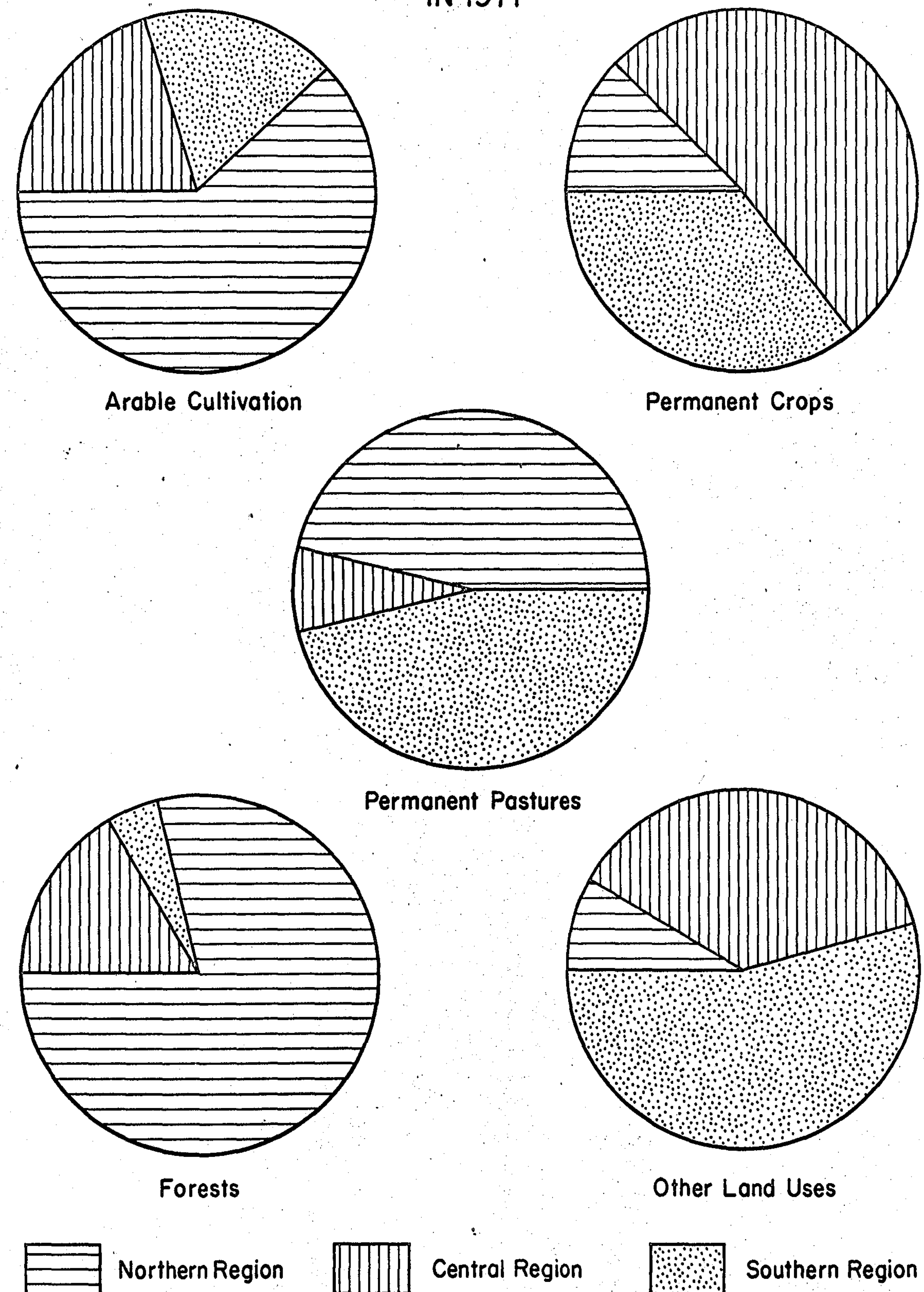
It has already been mentioned earlier that 48 million donums is accepted as a working estimate for all cultivable land in Iraq, of which 16 million donums lie in the rainfed area and 32 million donums in the irrigated area. Here we attempt to estimate how much land is utilized in each category.

Table 4.3 The Distribution of Land Utilization by Region in 1958/59 and in 1970 in Iraq

Region / Form of Utilization	Northern Region		Central Region		Southern Region	
	1958/59 %	1970 %	1958/59 %	1970 %	1958/59 %	1970 %
Arable land	45.2	62.0	23.6	20.2	31.2	17.8
Fallow land	50.0		22.4		27.6	
Permanent crops	12.5	12.5	40.7	51.7	46.8	35.7
Permanent pastures	33.4	46.5	16.2	6.5	50.4	47.0
Fodder crops	4.6		82.3		13.1	
Forests	79.3	78.7	6.4	16.5	14.3	4.8
Other lands		8.2		37.6		54.2

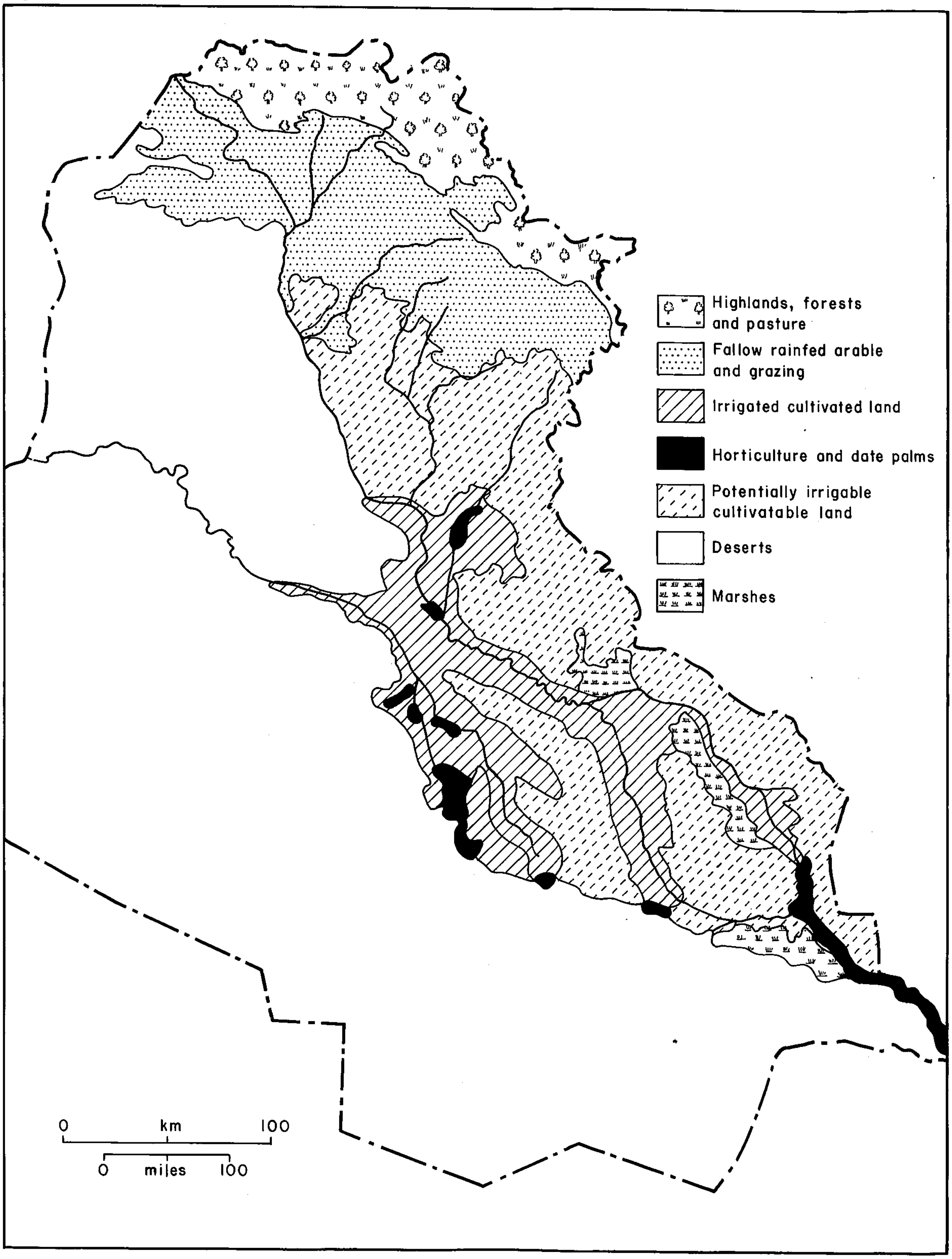
Source : Calculated from Appendix B, Tables B.1 and B.2

Fig 4·3 REGIONAL DISTRIBUTION OF LAND. UTILIZATION IN 1971



Based on Table 4·3

Fig 4·4 GENERALIZED MAP OF LAND USE IN IRAQ



4.6.1 The Utilized Land In The Rainfed Area

A division of the cultivable or cultivated land into rainfed and irrigated areas is very complicated. Basically, the variability of rainfall is the most important factor in the delimitation of the rainfed area. [26] For example, a good rainfall season may push the boundary of the rainfed area of northern Iraq further to the south, and vice versa in poor rainfall seasons.

The delimitation and definition of the area under dry farming in Iraq varies from one author to another.[27] For example, according to an UNESCO study dry farming can be practiced with good success in a rainfall area with over 240 mm. of rain, whilst another study puts the limits of dry farming to lie between 200 and 300 mm. of rainfall. [28,29] In fact, the rainfed area should be delimited where dry farming is economically profitable and not risky, and that will depend also upon other factors, such as farming practice itself, soil conditions, etc.

In 1951, the IBRD reported that there were 3.5 million donums actually under crops. [30] This means that the cultivated area was then about 7 million donums, applying a correction for the fallow system. Jawad Hashim and others estimated the cultivated area at 11 million donums in 1970.[31] If we assume this last figure is reasonably accurate and that land utilization is based on the fallow system, then about 5.5 million donums were then cropped annually.

In the period between the IBRD and Jawad Hashim estimates of 1951 and 1970 respectively, the cropped area in the rainfed area apparently increased by 2 million donums and therefore the total cultivated land increased by 4 million donums. This estimate is very close to the figures reported by the 1952/53 agricultural census. [32]

Another study by Naji Abdul Khadder estimated the cultivated rainfed area at 13.7 million donums.[33] He also estimated the total cultivated area would be 14 million donums by 1980. Table 4.4 shows these estimates in detail. These figures are clearly high compared with the other figures mentioned.

However, according to the 1951/52, 1958/59 and 1971 agricultural censuses, the cultivated rainfed area was 11, 15.44 and 12.1 million donums respectively.[34, 35, 36] The aggregate figures include lands in the Central and Southern provinces which at the time of the censuses were reported to be cultivated without irrigation, being 2.34 and 0.76 million donums in 1958/59 and 1971 respectively. The true rainfed area of normal rather than periodic non-irrigated farming, as defined by precipitation parameters excludes these Central and Southern lands and the adjusted figure for the rainfed area is then 13.1 and 11.34 million donums in 1958/59 and 1971 respectively. The 1958/59 adjusted area for cultivated rainfed land is then very close to the figures reported by Naji Abdul Khaddar, whilst the 1971 adjusted cultivated rainfed area is close to the 1952/53 and Jawad Hashim figures.

It can be assumed from the foregoing discussion that the estimated cultivated rainfed area is between 11 and 13 million donums.

Reviewing all these estimates enables us to arrive at a realistic estimate of the cultivated rainfed area by using the following assumptions:-

1) All areas under wheat and barley production in the Northern provinces (Ninevah, Arbil, Sulaimaniya and Kirkuk) depend on winter rainfall within the rainfall isohyet of 240 mm. (see Chapter 11 for more detailed analysis).

2) Half of the cultivated land can be assumed to be fallow annually.

From data available on the area under wheat and barley production in the northern provinces, we know that the average area under these two crops for 27 years (1950-1976) is 5.9 million donums (see Appendix H, Tables H.1 and H.3 for details).

Table 4.4 Cultivated Irrigated and Rainfed land in Iraq by province

Province	Cultivated land in 1970				Planned cultivated land				1980 Projection			
	Irrigated area		Rain-fed	Total	Irrigated area		Rain-fed	Total	Irrigated area		Rain-fed	Total
	Tigris	Euph-rates			Tigris	Euph-rates			Tigris	Euph-rates		
Nineveh	236	-	8,714	8,950	1,237	-	396	1,633	1,473	-	9,110	10,583
Arbil	191	-	2,119	2,310	713	-	91	804	904	-	2,210	3,114
Sulaimaniya	36	-	658	694	145	-	29	174	181	-	687	868
Kirkuk	707	-	1,908	2,615	-	-	85	85	707	-	1,993	2,700
Northern Region	1,170	-	13,399	14,569	2,095	-	601	2,696	3,265	-	14,000	17,265
Diala	1,643	-	-	1,643	803	-	-	803	2,446	-	-	2,446
Baghdad	3,875	1,000	-	4,875	81	-	-	81	3,956	1,000	-	4,956
Anbar	-	365	-	365	-	-	-	-	-	365	-	365
Kerbela	-	200	-	200	-	-	-	-	-	200	-	200
Babil	-	1,719	-	1,719	-	324	-	324	-	2,043	-	2,043
Central Region	5,518	3,284	-	8,802	884	324	-	1,208	6,402	3,608	-	10,010
Al-Qadisiya	-	1,947	-	1,947	-	808	-	808	-	2,755	-	2,755
Wasit	3,190	-	-	3,190	416	-	-	416	3,606	-	-	3,606
Thi-Qar	1,388	850	-	2,238	309	455	-	764	1,697	1,305	-	3,002
Maysan	272	-	-	272	1,967	-	-	1,967	2,239	-	-	2,239
Basrah	346	-	-	346	929	-	-	929	1,275	-	-	1,275
Southern Region	5,196	2,797	-	7,993	3,621	1,263	-	4,884	8,817	4,060	-	12,877
Iraq	11,884	6,081	13,399	31,364	6,600	1,587	601	8,788	18,484	7,668	14,000	40,152

Source: Saman, B.B. (1973) : Some Light on Some Important Aspects of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq, part 2, page 126, (in Arabic).

Applying our second assumption gives a cultivated rainfed area of 11.8 million donums. Adding, however, an extra 200,000 donums for other crops which grow in this region, such as lentils, vetch, chick peas and sugar beet, etc., one may safely assume that the utilized rainfed area is about 12 million donums. Fig. 4.5 shows a first approximation boundary of a rainfed area thus defined and which shows that almost all the area of the first four provinces listed in Table 4.4 is covered. This rainfed area grades into zones in which rainfall is associated with high variability and average rainfall totals below those in the true rainfed zone. This area which cannot accurately be delimited is not an area in which permanent rainfed agriculture can be maintained.

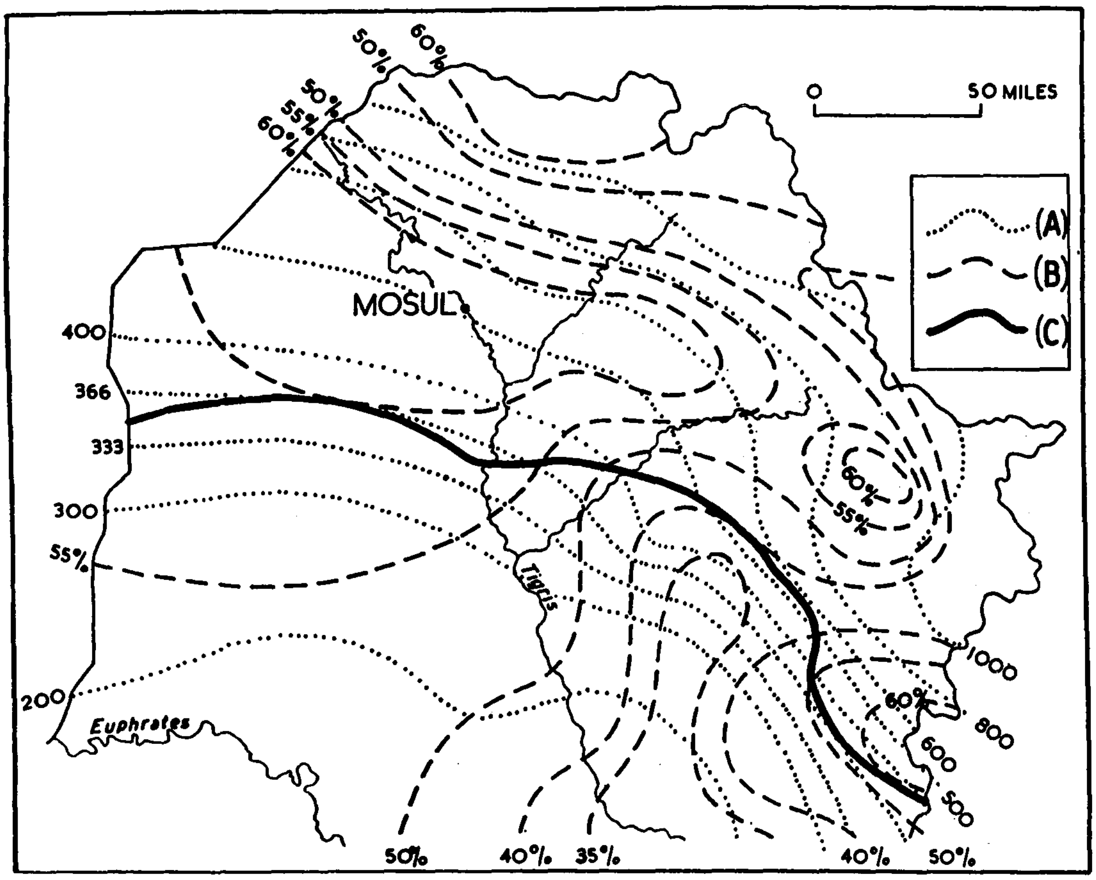
If our estimate, which is based on actual land utilization in the rainfed area, is accepted, one may anticipate that there are possibilities of increasing agricultural production in rainfed areas, both through vertical and horizontal expansion.

4.6.2 Irrigated Land

In discussing the size of the area of irrigated land we face the same scarcity of accurate statistical data as in the case of the rainfed area. It was noted earlier that the cultivable hypothetically irrigable land area has been estimated at 32 million donums by several sources. However, the area of utilized irrigated land, which consists of both land under crops and in fallow varies from one estimate to another.

The IBRD estimated the area actually cropped in the irrigated area at 7.6 million donums in 1951.(37) Hassan M. Juma'a estimated the utilized land in the irrigated area at 15 million donums in 1965, of which 5.8 million donums were under modernized irrigation systems in some form, and 9.2 million donums are either irrigated by pumps or by old irrigation systems.(38) Naji Abdul Khadder estimated the utilized irrigated

Fig 4.5 Reliability of Precipitation and The Southward Limit of Rainfall Zone.



Letters refer as follows: (A) isohyets for average mean annual precipitation over four-year period, 1936 to 1939. (B) isopleths for reliability of precipitation over period 1936 to 1939, the lowest mean annual aggregate expressed as a percentage of the highest for each station. (C) southward limit of zone where reliability of precipitation, plotted against average mean annual aggregate, indicates an assured minimum of 200 millimeters (over period 1936 to 1939).

Source: Davies, D.H. (1957): Observations on Land Use in Iraq, Economic Geography, VOL. 33, pp. 122-134.

area at nearly 18 million donums in 1971 and examined plans to increase this to 26.2 million donums by 1980 (see Table 4.4). Many, however, have argued that these figures are high and existing water resources are not enough to support such an increase.

The lowest estimation of the utilized irrigated area, on the other hand, is of 12 million donums by Jawad Hashim in 1970. [39]

The only official figures on the utilized irrigated area were put in 1963 before the International Committee on the utilization of the Euphrates river waters by Iraq, Syria and Turkey. This Iraqi presentation gave an estimated total area under irrigation projects of 13.5 million donums. [40] Table 4.5 shows the irrigated area classified by river basins, irrigation projects under construction and the planned irrigation projects until 1980. The total irrigated area was planned to grow to 15.7 million donums in 1980. If the planned irrigation projects had been completed, it would have brought the total irrigated area up to 22.1 million donums.

One of the most recent studies was carried out by Russian experts in 1974 which stated that, of the total irrigation land stock of the country which was equal to 27 million donums under then conditions, only 9.5 million donums were supplied with irrigation networks and used in irrigation farming. [41] It is clear that the Russian experts underestimated the irrigable cultivable land by 5 million donums. Secondly, it is not clear what they meant by an irrigation network, and whether this only covered controlled systems or modernized irrigation systems. Nonetheless, the Russian estimate of utilized irrigated area is less than the official estimates by 4 million donums. Table 4.6 shows their proposed irrigation development plans to 1995 , which would bring the total area with irrigation networks to 15.8 million donums.

Table 4.5 Irrigated Area in Iraq According to Government Figures (Thousand Donums)

River Basin	Utilized Irrigated Area in 1963			Irrigation Projects under Construction until 1980	The Irrigated Area up to 1980	Planned Irrigation Projects
	Gravity Irrigation	Pump Irrigation	Total			
Shatt Al-Arab	447	-	447	-	447	-
Tigris	5,600	1,098	6,698	2,201	8,899	6,367
Euphrates	4,933	1,462	6,395	-	6,395	-
Total	10,980	2,560	13,540	2,201	15,741	6,367

Source: Saman, B.B. (1973) Some Light on Some Important Aspects of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq, Part 2, pp.118-123 (in Arabic).

Table (4.6) Planned Increments of Irrigated Lands by Stages of Development

(Million donums)

River Basin	Total area of lands with irrigation network planned up to 1995	Area of irrigated land with closed drainage	Total area of annually irrigated lands up to 1995 (net)	% of annually irrigated lands of the total area with irrigation networks	Actual area of annually irrigated lands (average) for the period of 1968-72	Increment of annually irrigated lands by years				Grand total for the period of
						1971-75	1976-80	1980-85	1986-93	1971 - 1995
1. Euphrates River	5.63	1.53	4.21	75	2.37	0.01	0.13	0.43	1.27	1.84
2. Tigris River inc.	9.74	4.46	8.87	91	3.80	0.18	0.53	0.70	3.66	5.07
Greater Zab River	0.47	-	0.47	100	0.08	0.06	-	-	0.33	0.39
Lesser Zab River	0.89	0.17	0.89	100	0.24	0.03	0.24	0.24	0.13	0.64
Adhiam River	0.33	0.33	0.33	100	0.09	-	-	-	0.24	0.24
Diylala River	1.50	1.19	1.50	100	0.97	0.01	-	-	0.52	0.53
3. Zone of Shatt Al-Arab	0.42	0.42	0.42	100	0.10	-	0.06	0.11	0.15	0.32
Total for Iraq	15.79	6.41	13.50	85	6.27	0.19	0.72	1.24	5.08	7.23

Source : Ministry of Irrigation and Selkozpromexport (USSR) (1975) : General Scheme of Water Resources and land development in Iraq, Baghdad, Iraq, Table 4.2.1-1, p.68.

In addition to these estimates, the agricultural censuses of 1952/53 and of 1958/59 estimated the irrigated area at 11.65 and 14.7 million donums respectively. However, none of these estimates reveals the actual annual cropped area, except the Russian one which estimated the annual irrigated cropped area at 6.27 million donums. This figure is less than the IBRD figure by 1.33 million donums.

We attempt here freshly to estimate the utilized irrigated area, using all the data sources available, particularly those referring to the cropped area. According to the Statistical Abstract of 1971, the average area of utilized land in Iraq during 1968-70 was 12.75 million donums for the combined rainfed and irrigated areas. Previously we have noted that the utilized rainfed area may be reasonably estimated at 6 million donums which gives an average cropped irrigated area of some 6.75 million donums. This estimate is very close to the Russian estimate. According to the government, in 1963 the total irrigated area was 13.5 million donums. Applying an annual fallow system correction gives 6.75 million donums cropped annually, and these figures are exactly as in our estimation.

Summing up the foregoing discussion of agricultural land utilization one may safely assume the following points:-

1) The total potentially cultivable land is some 48 million donums, of which 32 million donums are in the potentially cultivable irrigable area and 16 million donums are in the potentially cultivable rainfed area. Only 25.5 million donums are utilized annually in both regions.
2) The minimum area of cultivated land in the rainfed area is 12 million donums, of which some 6 million donums are cropped annually.
3) The cultivated irrigable area is 13.5 million donums, of which 6.75 million donums are cropped annually.
4) There are many possibilities of increasing agricultural production in both rainfed and irrigated areas through vertical and horizontal development. Such progress will depend on economic and technical investment to improve land utilization in the future.

4.7 Changes In The Rural Population Structure

Most of the population pressure on agricultural land comes indirectly from the rural population and directly from the farm population. Changes in the rural or farm population in relation to potentially cultivable or cultivated land will have a major impact on many socio-economic and technological aspects (see page 132).

Most of the information available on the rural and farm population comes from general agricultural and population censuses, and hence the accuracy and reliability of these statistics must be approached with caution (page 32). It is, in any case, rather difficult to distinguish between farm and rural populations in developing countries, since a large proportion of the rural population in developing countries is dependent on agriculture in one way or another even if not engaged in farming.[42] The purpose of this section is to study : first, changes in farm population in relation to rural population, and secondly, agricultural employment. This helps in the analysis of the effect of population pressure on agricultural land resources in the whole country as well as in each region.

4.7.1 Changes in Farm Population

It has been already noted that the proportion of the rural population to the total population declined from 64.0 per cent in 1947 to only 36.5 per cent in 1977 (see Table 2.2). Despite this, the absolute numbers of the rural population increased in magnitude from 3.1 million in 1947 to 4.4 million in 1977. Farm population, on the other hand, increased from 3.0 million in 1958 to almost 4.0 million in 1971, or an increase by 31.5 per cent (see Table 4.7). This means that farm population increased at a compound rate of 2.1 per cent per annum. Table 4.7 shows the percentage increases in farm population between 1958/59 and 1971 by regions and provinces. It appears from this table that the smallest increase occurred in the Southern region, and that some provinces such as Al-Qadisiya and Maysan, showed an actual decline in farm population. The main reason for this is the migration from these provinces either to urban centres or to other rural areas where jobs may be available.

In 1958/59, the distribution of farm population according to regions reveals that the largest proportion of farm population was in the Southern region with 39.2 per cent of the total farm population, whilst only 26.9 and 33.9 per cent were located in the Central and Northern regions respectively (see Table 4.8). A large proportion of the farm population was in the Northern region associated with the vast area of cultivable arable land (see Appendix B, Table B.1 and B.2 for details), whilst in the Southern region, multi-cropping, the concentration of date-palms, and other agricultural activities, such as fishing and livestock grazing made relatively high labour intensive demands on the farm population.

The 1971 agricultural census shows that 34.8 per cent of the farm population was in the Northern region, whilst only 31.2 and 33.9 per cent of the farm population were in the Central and Southern regions respectively (see Table 4.8). Also, this Table shows that the proportion of farm population in the Southern region declined from 39.2 per cent in 1958/59 to 33.9 per cent in 1971. The main reason for this is migration from this region, probably to the Central region which shows the biggest increase.

The provincial distribution of the farm population reveals that Nineveh, Al-Qadisiya and Thi-Qar had the largest share of the farm population in 1959/59. This was probably due to the large proportion of the utilized land in these provinces (see Appendix B, Table B.1 and B.2 for details). Nineveh province shows a real increase in farm population in 1971. Meanwhile in Al-Qadisiya province not only did the proportion decline, but the farm population also declined numerically, and the same situation occurred in Maysan province in 1971 (see Tables 4.7 and 4.8). Baghdad province showed a real increase in farm population in 1971.

Generally speaking, it seems there is a certain degree of association between land availability and the size of the farm population as we have noted in Nineveh, Al-Qadisiya and Thi-Qar provinces. Inversely, Kerbela has the smallest utilized land and farm population. Appendix B, Tables B.2 and B.3 show farm population by provinces in 1958/59 and 1971 respectively.

4.7.2 Agricultural Employment

Agricultural employment increased from 1.5 million in 1958/59 to 2.11 million in 1971, and according to the population census of 1977, agricultural employment dropped to less than one million (see Appendix B, Table B.5 and Table 2.6). This decline in agricultural employment is partly the result of a real loss due to rapid migration (see page 25) and partly related to changes in definitions of employment in agriculture and population censuses.

Table 4.7 shows the percentage increase in agricultural employment between 1958/59 and 1971. As in the case of farm population, the smallest increase in agricultural employment occurred in the Southern region with an increase of 14.1 per cent; Al-Qadisiya and Maysan provinces show a decrease in agricultural employment. This low or negative increase in agricultural employment can be explained by migration out of this region. The largest increase in agricultural employment occurred in the Northern region, whilst the Central region was in second place.

The distribution of agricultural employment by regions, Table 4.8 shows that 39.3, 31.5 and 29.2 per cent of agricultural employment were in Southern, Northern and Central regions in 1958/59 respectively. This can be explained by factors considered earlier (see page 123). In 1971, agricultural employment was more evenly distributed with 35.5, 33.8 and 30.6 per cent being in Northern, Southern and Central regions respectively.

Table 4.7 Changes in Farm Population and Agricultural Employment Between 1958/59 and 1971

Province	Farm Population %	Agricultural Employment %
Nineveh	42.2	71.9
Arbil	18.1	42.6
Sulaimaniya	50.3	42.5
Kirkuk	22.5	18.0
Northern Region	35.0	49.7
Diala	40.7	43.0
Baghdad	63.7	18.6
Anbar	39.7	48.5
Kerbela	119.6	143.9
Babil	44.8	40.0
Central Region	52.7	39.6
Al-Qadisiya	- 2.8	-28.7
Wasit	65.3	19.6
Maysan	- 4.2	-23.5
Thi-Qar	3.4	175.5
Basrah	53.1	34.6
Southern Region	13.9	14.1
Iraq	31.5	32.7

Source: Calculated from Appendix B, Tables B.3, B.4 and B.5 .

Table 4.8 The Distribution of Farm Population and Agricultural Employment in Iraq

Province	1958/59		1971	
	Farm Population %	Agricultural Employment %	Farm Population %	Agricultural Employment %
Nineveh	14.7	13.0	15.9	16.8
Arbil	6.2	4.9	5.5	5.2
Sulaimaniya	5.8	7.3	6.7	7.9
Kirkuk	7.2	6.3	6.7	5.6
Northern Region	33.9	31.5	34.8	35.5
Diala	6.7	6.4	7.2	6.9
Baghdad	8.0	10.1	9.9	9.1
Anbar	3.9	3.4	4.1	3.7
Kerbela	1.5	1.5	2.5	2.8
Babil	6.8	7.8	7.6	8.2
Central Region	26.9	29.2	31.3	30.7
Al-Qadisiya	10.8	12.6	8.0	6.8
Wasit	4.4	5.9	5.5	5.3
Maysan	7.7	10.0	5.6	5.8
Thi-Qar	11.0	4.7	8.6	9.7
Basrah	5.3	6.1	6.2	6.2
Southern Area	39.2	39.3	33.9	33.8
Iraq	100	100	100	100

Source : Calculated from Appendix B, Table B.3 , B.4 and B.5

The provincial distribution of agricultural employment follows almost the same pattern as farm population, except in Al-Qadisiya and Maysan provinces where their share of agricultural employment declined, whilst Thi-Qar province showed a significant increase in employment in 1971 (see Tables 4.7 and 4.8).

4.7.3 The Relation Between Rural, Farm Population and Agricultural Employment

The first measure to be examined here is the relation between rural and farm population in Iraq. Theoretically speaking, the ratio of farm population to the rural population may decline as the country develops. This decline could be explained by : firstly, the expansion of non-farming activities among rural dwellers as results of rural industry development, the growth of the agricultural servicing sector, such as farm machinery repairs, and other services; secondly, changing people's attitudes towards rural areas and finally implementing technology, such as mechanization, may cause a decline in farm population in general and probably in direct farming employment in particular.[43,44]

In the case of Iraq, available statistics reveal that 78.2 per cent of the rural population in 1958 was considered to be farm population and this increased to 99.4 per cent in 1971 (see Table 4.9). It is rather difficult to accept that 99.4 per cent of the rural population was a farm population simply because this would mean that non-farmers such as teachers, doctors, government officials, traders, etc., living in rural areas would make up only 0.6 per cent of the rural population - an unacceptably low figure.

For example, the ratio of farm population to the rural population was 83.9, 89.4 and 64.4 in Iran, Syria and Turkey in 1950 respectively.[45] Comparing these ratios with the 1971 Iraqi ratio one may assume that the farm population was over-estimated in 1971. Probably the main reason for the statistical increase is the failure to distinguish between farm and non-farm employment, and partly due to changes in statistical definition of the farm people.

An increasing farm population with more people involved in agricultural production would have many socio-economic and technical consequences, such as employment, income, etc., as will be shown later in this chapter.

The second ratio we can examine is that between agricultural employment and farm population. Table 4.9 shows that both in the 1958/59 and 1971 agricultural censuses more than half of the farm population was in active agricultural employment. This, in turn, also implies that nearly 50 per cent of the Iraqi population was considered economically active, as we have also deduced in Chapter Two (see page 30). This in turn may cause a real pressure on land resources in Iraq in the future as more people enter the employment age group, and bearing in mind that a high proportion of agricultural workers work for a longer proportion of their life-span than do others. But, since a decline in agricultural employment is indicated in the 1977 population census, one may more safely assume that there is no risk of dangerous pressure on land resources in the future, especially if the possibilities of improving land utilization are considered.

Table 4.10 shows the ratio of agricultural employment to farm population in 1958/59 and 1971 for provinces and regions. This Table reveals that the ratio of agricultural employment to farm population apparently varies considerably from one province to another. For example, the ratio of agricultural employment to farm population was 22.6 in Thi-Qar province, whilst the highest ratio was 70.9 in Wasit province in 1958/59. Since there were no major differences in agricultural activities between these provinces, the only explanation which can be given is related to statistical errors. In 1971, the ratio of agricultural employment

Table 4.9 The Structure of Rural Population in Iraq

Ratio \ Year	1958/59	1971	Changes %
FARM/RURAL[(1)]	78.2	99.4	27.1
AGE[(2)] /FARM[(2)]	52.7	53.1	0.76

FARM : Farm population

AGE : Agricultural Employment

RURAL : Rural population

Source : 1. Ministry of Planning (undated) : Economic Indicators of the Development of The Iraqi Economy, Baghdad, Iraq, Table 1 , page 40, (in Arabic)

2. Appendix B, Tables B.3, B.4 and B.5 .

Table 4.10 Ratio of the Agricultural Employment to the Farm Population and its Percentage of Change

Province	AGE/Farm 1958/59	AGE/Farm in 1971	Percentage of change
Nineveh	46.5	56.1	20.6
Arbil	41.3	49.8	20.6
Sulaimaniya	66.3	62.8	- 5.3
Kirkuk	46.2	44.5	3.7
Northern Region	48.9	54.2	10.8
Diala	50.0	50.9	1.8
Baghdad	67.0	48.5	-27.6
Anbar	45.4	48.3	- 6.4
Kerbela	53.1	59.0	11.1
Babil	60.0	58.0	- 3.3
Central Region	57.1	52.2	- 8.6
Al-Qadisiya	61.5	45.2	-26.5
Wasit	70.9	51.3	-27.6
Maysan	68.6	54.8	-20.1
Thi-Qar	22.6	60.1	165.9
Basrah	60.1	52.8	-12.1
Southern Region	52.9	52.9	0
Iraq	52.7	53.1	0.76

AGE = Agricultural Employment

Farm = Farm population

Source: Calculated from Appendix B, Table B.3, B.4 and B.5

to farm population is more homogeneous than in 1958/59, but nonetheless there are some variations. The main reason for such variation seems to be related to the different types of agricultural activities in the provinces, for example, tobacco cultivation in Sulaimaniya province requires extra labour which can usually be recruited from within farmers' families, and the same can be applied to other provinces such as Basrah where date growing requires extra labour inputs.

4.8 Population Pressure on Agricultural Land

It might be true to say that land and labour are the most important factors in agricultural production, especially in developing countries where agriculture is little modernized.[46, 47] Both of these factors, agricultural land and population, are affected by geographical forces as well as by economic development level. However, it is likely that the land factor is more affected by geographical elements such as environmental characteristics, location, etc. than by economic development level, whilst the population factor, quantitative and qualitative is more likely to be affected by economic development levels than by geographical location,etc.[48]

The relationship between population and land resources can be measured by man-land ratios, either between the total population or segments of the population on the one hand, and various measures of the supply of land resources on the other.[49] In this section an attempt will be made to measure man-land ratio between (a) total population, rural population and potentially cultivable land, (b) farm population, utilized land and arable land and (c) agricultural employment, utilized land and arable land.

Using man-land ratio for comparative purposes is, however, often very complicated. Many have dismissed man-land ratios, especially for making comparisons, as invalid because of the variations between countries in land resources inventory, population, land utilization, technological know-how, etc.[50] Others argue that man-land ratios may be used for comparative purposes if this is associated with certain carefully stated assumptions and hypotheses.[51]

Changes over time in man-land ratios may have several socio-economic and technical causes and consequences. Probably one of the most obvious outcomes is on the capability of land resources to provide adequate supplies of food to the people. Man-land ratio may affect the form of land utilization in terms of eliminating, as much as possible, fallow land, or expanding cultivation to include even the marginal land. Other aspects, such as income, employment, value of land, rent, farmer's share in the case of share cropping systems, introducing the level and kind of technology, land tenure, size of the holdings, labour and land productivity, and rural-urban migration, all these are also affected by changes in relation between population and land resources.[52, 53, 54]

4.8.1 The Man-Land Ratio:Between Total Population, Rural Population and Potentially Cultivable Land

Examining the relationship between total population and potentially cultivable land in Iraq is a useful starting point. It was earlier noted that agriculture in Iraq is in a better position than other countries in the Middle East in terms of the availability of natural resources, especially land and water (see pages 101 and 335-338).

Table 4.11 shows the changing man-land ratio between the total population and the potentially cultivable land in the period between 1947 and 1977. It is clear from this table that the ratio of the total population to potentially cultivable land increased from 40.1 personsper sq. km. in 1947 to 100.2 personsper sq. km. in 1977 - in other words increased by two and half fold in twenty years. Therefore, the compound rate of growth of the man-land ratio of total population to the potentially cultivable land was 4.7 persons per sq. km. per year . If the rate of population growth continues at 3.3 per cent per annum, there would be about 250 persons per sq. km. of potentially cultivable land by the turn of the century, and this may seem alarming.

Nonetheless, not all the population is engaged in agricultural activities, although most of the people who are directly involved in agricultural activities live in rural areas. Table 4.11 shows the ratio of the rural population to the potentially cultivable land between 1947 and 1977. It is obvious from this table that the ratio of rural population to the potentially cultivable land increased from 25.7 persons per sq. km. of potentially cultivable land in 1947 to 36.6 persons per sq. km. in 1977. This means that the rural man-land ratio increased by 10.9 persons per sq. km. of potentially cultivable land during the 1947-1977 period. The compound rate of growth of the rural man-land ratio was 1.76 rural persons per sq. km. of potentially cultivable land, very much lower than the compound rate of growth of total population per sq. km. of potential cultivable land. This low increase is a result of migration from rural to urban areas during the same period (see page 25) This means that the pressure on potentially cultivable land will be fairly low if such a low growth of the rural population is maintained.

Assuming, moreover, that the total utilized land was 25.5 million donums (63750 sq. km.) (see page 121), the man-land ratio for the total population and rural population would be, respectively, 188 and 68 persons per sq. km. of utilized land in 1977. This implies that man-land ratio per sq. km., especially between the rural population and utilized land could be improved even further by increasing the utilized proportion of potentially cultivable land. This will depend very much on the future quantity and quality of government investment in agriculture, and on other aspects, such as the cost of introducing new land. (55)

Table 4.11 Man-Land Ratios in Iraq*

(Area in sq. kms.)

	1947	1958	1965	1977
Total Population / Cultivable land	40.1	52.5	67.1	100.2
Rural Population / Cultivable land	25.7	32.1	32.8	36.6

* Data on population is obtained from Table 2.2, and the cultivable land is assumed 48 million donums or 120,000 sq.km.

4.8.2 The Relationship Between Farm Population, Utilized and Arable Lands

It was earlier noted that a large proportion of the rural population is considered to be a farm population (see page 127), and, on this basis, there should be few differences between rural and farm man-land ratios for different segments of agricultural land. Here we study different forms of man-land ratios for different provinces and this may help to establish if there is a significant relationship between farm man-land ratio and the form of land utilization. Secondly, we examine the differences between these man-land ratios between 1958/59 and 1971.

Considering the ratio of farm population man-land ratio for utilized land, Table 4.12 reveals that the farm man-land ratio was 39.2 persons per sq.km. of utilized land in 1958/59 and increased to 69.3 persons per sq. km. in 1971, i.e. an increase of 76.8 per cent between 1958/59 and 1971. There are two reasons for such increases; first, an increase in the farm population from 3.0 million in 1958/59 to 3.9 million in 1971 (See Appendix B, Tables B.3 and B.4 for details). Secondly, there was a decline in the utilized land from 30.8 million donums (77,000 sq.km.) in 1958/59 to 22.9 million donums (57,250 sq. km.) in 1971 (see Appendix B, Tables B.1 and B.2 for details). The problem here mainly concerns the decline of utilized land by 1971, and one cannot totally be sure of the reasons for such a decline. This decline could be explained by : (a) the over-estimation of utilized land in 1958/59, (b) an under-estimation of utilized land in 1971, and (c) a real reduction in the utilized land as a result of soil salinization. Nonetheless, one could assume that the farm population man-land ratio increased as a result of a real increase in farm population regardless of any decline in the utilized land.

Considering farm man-land ratios of utilized land for each region, Table 4.12 reveals the following points:-

1) The farm man-land ratio was the lowest in the Northern region. The farm man-land was 28.7 persons per sq. km. of utilized land in 1958/59 and increased to 44.5 persons per sq. km. in 1971, or an increase of 55.1 per cent (see Tables 4.12 and 4.13).

2) The farm man-land ratio was 44.9 persons per sq. km. of utilized land in 1958/59 and increased to 94.2 persons per sq. km. in 1971, or an increase of 109.8 per cent in the Central region (see Tables 4.12 and 4.13).

3) The highest farm man-land ratio was in the Southern region with 50.9 persons per sq. km. of utilized land in 1958/59 and increased to 103.2 persons per sq. km. in 1971, i.e. an increase of 102.8 per cent (see Tables 4.12 and 4.13).

Despite the migration from the rural to urban areas, the farm population, especially in the Central and Southern regions, increased its pressure on utilized land in these regions. Here, one may probably assume in this particular case, that the reduction in the utilized area by 1971 was the main reason for this increased pressure (see Appendix B, Table B.1 and B.2 for details).

The main reasons, however, for the low farm man-land ratio per sq. km. of utilized land in the Northern region related to the nature of rainfed arable farming in this region, whilst in the Central and Southern regions, high farm man-land ratio per sq. km. of utilized land is related to the number of more labour intensive agricultural activities, such as orchards and rice production (and fishing for which data is included in figures for the "farm" population). Most farming depends on irrigation in these regions and on small and medium sized holdings associated with relatively high demands for labour.

The provincial farm man-land ratio for the utilized land, Table 4.12

reveals that the lowest farm man-land ratio was 18.1 persons per sq.km. in Wasit in 1958/59, where it increased to 49.0 persons per sq. km. of utilized land in 1971. It also appears from this table that the Northern provinces, except for Sulaimaniya, had very low man-land ratios. The reasons for that are mainly related to the types of farming, as already discussed in considering the proportion of the farming population in the total rural population (see pp.124).

The highest farm man-land ratio was 196.5 persons per sq.km. of utilized land in Basrah province in 1958/59, which increased to 473.5 persons per sq. km. of utilized land in 1971. This could be explained in the same way.

The influence of farming systems on the size of the farm population can be observed if the ratio of the farming population man-land ratios to the area of arable land is considered. Table 4.12 shows that farm man-land ratios of the arable land was low in the Northern region, whilst the effect of other factors such as irrigation and multi-cropping is very obvious in the Central and Southern regions. Moreover, when we compare the ratios of farm population to utilized land with farm population man-land ratios to arable land we see that there were no significant differences in the Northern region, especially in 1958/59. This demonstrates the domination of arable cultivation on agricultural activities in Iraq as a whole (see Table 4.12).

The most important findings to appear from the previous discussion are as follows : First, the effect of land utilization on farm man-land ratio. In the Northern region where arable farming is dominant, farm man-land ratio is relatively lower than elsewhere in the country. Secondly, changes in man-land ratios over time seem more affected by changes in the area of utilized land than by increases in the farm population. The low growth rate of the rural population and, in particular the farm population, by comparison has shown little effect on these ratios. Thirdly, improved land utilization may also improve man-land ratio, for example, the farm man-land ratio is increased by 80 per cent when the annual fallow is excluded. Eliminating the fallow system could have a significant effect on farm man-land ratios.

4.8.3 The Relation Between Agricultural Employment, Utilized and Arable Lands

Not all of the farm population is in fact engaged in agriculture - housewives, young and old people and other dependants may often have to be excluded. We are then left only with agricultural employment which has a direct relation with land resources, especially in terms of production and income.(56)

Table 4.12 shows the ratio of agricultural employment to the utilized arable, cultivated arable and fallow arable land in Iraq. The ratio of agricultural employment was 14.0, 25.6 and 26.9 persons per sq. km. of the utilized land in 1958/59 in the Northern, Central and Southern regions respectively. These ratios increased to 24.1, 49.1 and 54.6 persons per sq.km. of the utilized land in the Northern, Central and Southern regions respectively in 1971. This means that agricultural employment man-land ratio for the utilized land increased by 72.1, 91.8 and 103.0 per cent in the three regions between 1958/59 and 1971 (see Table 4.13).

Table 4.12 shows the agricultural employment man-land ratio for the utilized land by provinces. On the whole it appears that the agricultural employment man-land ratios for the utilized land were lower in the Northern region, except in Sulaimaniya, whilst it was higher in the Southern and Central regions respectively. Table 4.13 shows the percentage increases of agricultural employment man-land ratio for the utilized land for each province. It is clear from this table that the

Table 4.12 Man-land Ratios in Iraq by Different Forms According to Province

Area in sq. km.

Province	FARM/UTL		FARM/ARABLE		AGE/ UTL		AGE/ARABLE		FARM/ACL	AGE/ACL	FARM/F	AGE/F
	1958/59	1971	1958/59	1971	1958/59	1971	1958/59	1971	1958/59	1958/59	1958/59	1958/59
Nineveh	25.3	35.7	25.6	36.6	11.7	20.0	11.9	20.5	49.9	23.2	52.4	24.4
Arbil	31.3	50.8	32.1	53.8	12.9	25.3	13.2	26.8	59.8	24.7	69.1	28.5
Sulaimaniya	51.0	152.8	52.7	167.1	33.8	96.0	34.9	105.0	79.6	52.8	155.9	103.3
Kirkuk	24.9	36.4	25.0	37.4	11.5	16.2	11.5	16.6	49.5	22.8	50.5	23.2
Northern Region	28.7	44.5	29.1	46.0	14.0	24.1	14.2	24.9	55.0	26.9	61.7	30.2
Diala	27.7	60.5	28.7	73.7	13.9	30.8	14.3	37.5	52.9	26.5	62 5	31.3
Baghdad	43.4	96.3	45.2	130.1	29.1	46.7	30.3	63.1	76.7	51.4	109.9	73.6
Anber	102.5	170.0	108.2	235.5	46.6	82.1	49.2	113.8	173.0	78.6	288.7	131.2
Kerbela	95.1	201.3	129.2	350.9	50.5	118.8	68.6	207.0	243.7	129.4	274.7	145.9
Babil	57.5	103.1	63.0	157.9	34.5	59.8	37.8	91.6	110.2	66.1	147.0	88.2
Central Region	44.9	94.2	47.4	126.9	25.6	49.1	27.1	66.2	83.6	47.7	109.6	62.5
Al-Qadisiya	57.4	92.8	60.4	142.4	35.3	41.9	37.1	64.3	103.7	63.8	144.4	88.8
Wasit	18.1	49.0	18.1	64.7	12.8	25.1	12.9	33.2	31.2	22.1	43.4	30.8
Maysan	55.8	134.1	56.6	189.0	38.3	73.5	38.9	103.6	117.1	80.4	109.6	75.2
Thi-Qar	63.4	114.9	68.0	201.0	14.3	69.1	15.3	121.0	101.1	22.8	207.3	46.8
Basrah	196.5	473.5	460.9	1950.6	118.0	250.1	276.8	1030.2	705.4	423.6	1329.4	798.3
Southern Region	50.9	103.2	53.6	156.1	26.9	54.6	28.4	82.6	91.7	48.5	129.1	68.3
Iraq	39.2	69.3	40.6	82.0	20.6	36.8	21.4	43.5	73.2	38.6	91.0	47.9

Abbreviations : FARM = Farm Population. UTL = Total Utilized land. ARABLE = Arable land (Fallow and cultivated)
AGE = Agricultural Employment. ACL = Arable cultivated land. F = Fallow land only

Sources : Calculated from Appendix B, Tables B.2, B.3, B.4 and B.5.

Table 4.13 Changes in Man-land Ratios Between 1958/59 and 1971*

Province	FARM / UTL %	FARM / ARABLE %	AGE / UTL %	AGE / ARABLE %
Nineveh	41.1	43.0	70.9	72.3
Arbil	62.3	67.6	96.1	103.0
Sulaimanyia	199.6	217.1	184.6	200.9
Kirkuk	46.2	49.6	40.9	44.4
Northern Region	55.1	58.1	72.1	75.4
Diala	118.4	156.8	121.6	162.2
Baghdad	121.9	187.8	60.5	108.3
Anbar	65.9	117.7	76.2	131.3
Kerbela	111.7	171.6	135.3	201.7
Babil	79.3	150.6	73.3	142.3
Central Region	109.8	167.7	91.8	144.3
Al-Qadisiya	61.7	135.8	18.7	73.3
Wasit	170.7	257.5	96.1	157.4
Maysan	140.3	233.9	91.9	166.3
Thi-Qar	81.2	195.6	383.2	690.8
Basrah	141.0	324.2	111.9	272.2
Southern Region	102.8	191.2	103.0	190.8
Iraq	76.8	102.0	78.6	103.3

* Abbreviations are as in Table 4.12

Source : Calculated from Table 4.12

smallest increase in this man-land ratio also occurred in the Northern region and the reasons for this are essentially the same as found in our examination of other ratios (see page 124).

The agricultural employment man-land ratio for the arable land was the lowest in the Northern region in both 1958/59 and 1971 (see Table 4.12). Nonetheless, agricultural employment man-land ratios increased when they were calculated for the cropped arable and fallow arable land separately. This shows the effect of land utilization on man-land ratio and the fact that poor land utilization may result in high man-land ratios.

4.9 The Competition for Land Use Between Agricultural and Non-agricultural Activities

The last factor which may affect the supply of agricultural land, comes from the non-agricultural sectors, such as industrial projects, urbanization, recreation areas, reservoirs, etc. Analysing the demand for land for these purposes is beyond the scope of this thesis. But, it can be said that the demand for land from these activities has increased and will increase in the foreseeable future because of the large scale of investment in industries, urban centres and transport facilities for example. It is already clear that the best agricultural lands near big cities, especially in the Baghdad Province, are already been absorbed for new urban uses. Consequently, this may affect the supply of agricultural production, especially in the short term until other lands are reclaimed. Nonetheless, using potentially agricultural land for non-agricultural purposes could be restricted if the government applied certain measures, such as zoning agricultural land.

4.10 Main Agricultural Products and Their Geographical Distribution

The characteristics of the land of Iraq have encouraged the production of a good variety of agricultural products during both the winter and summer seasons. Table 4.14 gives the area, production and yield of a number of winter and summer crops, remembering there are also other important crops, such as tobacco, dates and fruits which are not mentioned in this table.

Table 4.14 reveals that there is a large difference in land utilization between the winter and summer seasons. The cropped area in winter is about 9.7 million donums, whilst in summer it drops to almost 1.3 million donums. The availability of water in summer, both in rainfed and irrigated areas, is the crucial factor in land utilization during this season.

Therefore, as we see in Table 4.14, wheat and barley dominate land utilization in winter. Almost 96 per cent of the total cultivated area in winter is under wheat and barley production. This is one of the reasons for selecting wheat and barley production for our study of the effect of certain weather factors on yield (see Chapters 12 & 13). Land utilization during the summer season is mainly dominated by rice, watermelons, tomatoes and cotton. These crops occupy about 60 per cent of total utilized land in the summer season.

The geographical distribution of crop production reveals that winter crops, namely wheat and barley is concentrated in the rainfed areas of northern Iraq (see Tables 11.1 and 11.2). Summer crops, on the other hand, are mainly cultivated in the Southern region in the first place, and the Central region in the second.[(57)] This is due to the domination of rice production in the Southern region where large flooded areas provide a suitable location for rice production. Only a small proportion of land is utilized in the rainfed area for summer crops.

4.11 Conclusion and Final Remarks

Since Malthus drew attention to the possibility of population growing faster than agricultural production, the question remains whether there is enough land for cultivation. We have examined the position in

Table 4.14 Area, Production and Yield of Some Agricultural Crops*

Winter crops	Area (Donums)	Production (tonne)	Yield (kg/don.)	Summer crops	Area (Donums)	Production (tonne)	Yield (kg/don.)
Wheat	6,293,324	1,256,038	198.8	Rice	327,227	234,692	643.0
Barley	3,031,006	741,807	252.5	Cotton	114,332	35,477	317.3
Linseed	46,008	8,629	188.1	Sesame	63,389	10,288	159.2
Lentils	34,767	5,316	152.5	Millet	19,704	4,559	231.4
Dry Broad Beans	69,770	18,059	259.9	Green Gram	55,033	10,488	191.5
Vetch	3,291	769	228.6	Maize	24,402	8,305	310.6
Dry Onion	53,595	85,874	1610.1	Sorghum	23,671	6,746	287.1
Garlic	3,015	1,435	502.1	Dry Cow peas	24,470	5,627	228.7
Chick peas	23,521	3,793	164.7	Peanuts **	924	284	357.5
Sugar Beet	9,384	49,122	5,381.0	Tomatoes	134,934	271,196	1,983.5
Green Kidney Beans	60,189	76,227	1,279.8	Okra	53,714	89,031	1,652.6
Green Onion (Spring Onion)	28,475	65,601	2,341.4	Aubergine	40,780	141,471	3,438.9
Beet	4,358	11,448	2,598.7	Cucumber ***	78,333	128,362	1,640.7
Spinach	5,808	9,223	1,593.6	Squash	26,588	64,545	2,424.6
Chard	7,829	13,853	1,777.8	Watermelon	168,198	463,962	2,766.4
Lettuce	12,193	35,779	2,992.4	Melon	66,799	153,888	2,293.6
Radish	8,562	22,469	2,619.8	Green peppers	6,207	11,120	1,847.0
Carrot	3,579	9,669	2,714.3	Green cow peas	32,275	40.685	1,262.4
Green Beans	2,939	3,529	1,157.0				
Turnip	13,420	33,463	2,503.6				
Cabbage	4,085	13,340	3,319.0				
Cauliflower	22,980	5,943	2,618.6				

* Average 10 Year
** " 8 Year
*** " 3 Year

Source : Ministry of Planning (1975) : Annual Abstract of Statistics 1974, Baghdad, Iraq, Tables 50, 51, 52, and 55.

Iraq in respect of land utilization and the effect of population growth, especially of rural and farm population, on agricultural land resources by measuring certain man-land ratios.

Agriculture in Iraq is in a better condition than any other country in the Middle East because of the combined availability of potentially cultivable land and water resources on the one hand, and financial capability for agricultural developments on the other. The total potentially cultivable land is estimated at 48 million donums (12 million hectares), of which 16 million donums is estimated in the rainfed area and 32 million donums in the potentially irrigable areas.

Until now not all the potentially cultivable land is under utilization. The total utilized land is estimated at 25.5 million donums (see page 121). This means that nearly 53 per cent of the potentially cultivable land is actually under current utilization, this associated with seasonal crop growing based on annual fallow system (Nairen System) which implies that half of the utilized land is left idle every year. Given this type of farming, only about 27 per cent of the potentially cultivable land is cultivated annually.

However, data for the distribution of agricultural land classified according to land productivity or capability does not exist in detail. Official usage by the Ministry of Planning has classified land into three groups: first, utilized land which does not require any improvement; secondly, land capable of use and requiring partial improvement by supplying water and drainage facilities, and thirdly, land which requires improvements to soil conditions as well as the supplying of water and drainage facilities. This classification approximates to distinguishing high, medium and low land productivity but no estimate of the area of land in each class can be found.

Buringh, however, as shown in Table 4.1, attempted to classify land productivity into ten soil suitability categories which gave 3.4, 5.0 and 7.2 per cent of the potentially cultivable land as very good, good and fair for cultivation, the rest suitable only for grazing or being graded as sub-marginal.

Land utilization is dominated by arable farming, especially of wheat and barley - see Tables 4.2 and 4.14. All other utilization such as for orchard, forest or fodder crops, occupies a very small proportion of utilized land (see Table 4.2). The distribution of the utilized land shows that more than half of the arable land is in the rainfed area of Northern Iraq (see Table 4.3) with permanent crops located almost entirely in the Central and Southern regions and forests mainly in the mountainous rainfed area of Northern Iraq. The main reasons behind such distribution are clearly environmental. Sufficient winter rainfall allows arable farming in the north, whilst the availability of irrigation water in the Central and Southern regions has allowed the growth of permanent crops there. Low winter temperature prevents the growing of many such permanent crops, for example dates, in the Northern region.

Estimates were made of the actual utilized land in the rainfed and irrigated areas, these based on actual land use data. These estimates reveal that nearly 6.0 and 6.75 million donums were cropped annually in the rainfed and irrigated areas respectively which, in total, give an annual total cropped area in Iraq of 12.75 million donums. We have also estimated that only 37.5 and 21.1 per cent of the potentially cultivable areas are used in the rainfed and irrigated areas respectively.

Increasing population pressure, especially rural or farm population, on agricultural land resources has several socio-economic and technological impacts. Food production, incomes, size of the holding, land tenure system, land utilization, employment, technology and other aspects are affected by such pressure. Rural and farm populations and agricultural employment, in their relation to different segments of agricultural land were examined through different forms of man-land ratio.

It is clear from this chapter that farm population increased from 3.0 million in 1958/59 to almost 4.0 million in 1971, i.e. an increase of 32 per cent for the whole country. The compound rate of growth of farm population was 1.97 per cent per year between 1958/59 and 1971. Considering, however, the regional distribution of farm population, it appears that the smallest increase occurred in the Southern regions, and, therefore, some provinces in this region showed a decline in farm population (see Table 4.7). The largest proportion of farm population was found in the Southern region followed by the Northern and Central regions respectively in 1958/59, whilst the Northern region had the biggest share followed by the Southern and Central region respectively in 1971. This pattern of farm population distribution has a certain degree of association with the regional types of farming and agricultural land availability. For example, the availability of rainfed arable land in the north supported nearly one-third of the total Iraqi farm population; other forms of land utilization, for permanent crops, rice production usually based on irrigation make higher demands for labour. The provincial distribution of farm population also shows a strong association between farm population and land availability in each province (see Tables 4.8 & 4.4).

Data on agricultural employment is rather confused. According to agricultural censuses, agricultural employment increased from 1.5 million workers in 1958/59 to 2.11 million in 1971, whilst the population census of 1977 shows agricultural employment was less than a million. As stated earlier, the main reason for such a statistical decline is the way in which agricultural employment was calculated in 1977 population census. It is not likely to be related to a real decrease in agricultural employment because rural population increased in magnitude in 1977 (see Table 2.2), and, usually, increasing rural population is associated with an increase in agricultural employment. However, if agricultural areas are abandoned for one reason or another, such as soil salinization, or as a result of rapid mechanization, one may find a decline in agricultural employment; in this case there is no clear evidence available.

Available statistics suggest that in fact, a small increase in agricultural employment occurred in the Southern region between 1958/59, and 1971, but some provinces such as Al-Qadisiya and Maysan, showed a decline in agricultural employment (see Table 4.7). In general there would seem to have been net agricultural migration out of this region. The highest increase of agricultural employment occurred between 1958/59 and 1971 in the Northern region with an increase of 49.7 per cent (see Table 4.7).

In terms of the regional distribution of agricultural employment , the Southern region had 39.3 per cent of agricultural workers in 1958/59, dropping to 33.8 in 1971, whilst the Northern region's share of agricultural employment rose from 33.9 per cent in 1958/59 to 35.5 per cent in 1971 (see Table 4.8).

We further examined the relationship between rural population, farm population and agricultural employment, first considering the proportion of the rural population which could be regarded as farm population. The statistically reported increase from 78 per cent in 1958/59 to 99.4 per cent in 1971, is regarded as of dubious validity (see Table 4.9).

The second relationship, between farm population and agricultural employment, reveals that almost half of the farm population is considered as in active agricultural employment. This tallies with the estimate that half of the Iraqi population is considered to be economically active (see page 128).

The regional pattern of the relationship between agricultural employment and farm populations reveals some variants (see Table 4.10). The lowest ratio was in the Northern region and the highest ratio was in the Central region in 1958/59, whilst it was evenly distributed in 1971. However, the provincial ratios of agricultural employment to farm population varies tremendously between 1958/59 and 1971. The ratios of agricultural employment to farm population were lower or showed a slight increase, except Thi-Qar where the ratio increased from 22.6 per cent in 1958/59 to 60.1 in 1971, i.e. an increase of 165.9 per cent. The most obvious reason for that is the way in which agricultural employment is calculated.

A series of man-land ratios has been calculated between the different classes of population and different categories of agricultural lands. The first of these, was man-land ratio between total population and potentially cultivable land. This ratio increased from 40.1 to 100.2 persons per sq.km. of potentially cultivable land. The compound rate of growth of this ratio was 4.7 persons per sq. km. of the potentially cultivable land per annum, which, if extrapolated into the future would give an alarming 250 persons per sq. km. of potentially cultivable land by the turn of the century.

It is obvious, however, that most of the population pressure on land resources comes from the rural population and more specifically from the farm population which is directly involved in agriculture. The man-land ratio of the rural population to the potentially cultivable land increased from 25.7 rural persons per sq. km. of potentially cultivable land in 1947 to 36.6 persons in 1977, i.e. an increase of 42.4 per cent. The compound rate of growth of the ratio was 1.76 rural persons per sq. km. of the potentially cultivable land per annum. The main reason for such low growth was rural migration to urban areas (see page 25). Also, this low compound rate of growth of the rural man-land ratio may affirm that there was no significant pressure from the rural population on potentially cultivable land. Nonetheless, the question remains whether this potentially cultivable land will be fully utilized.

Probably, the most accurate man-land ratios reflecting pressure of population on agricultural land resources, are those between categories of population and the actual utilized land. Assuming that utilized land covered is 25.5 million donums (63750 sq. km.) in both cases, the man-land ratios of the total and rural population to the utilized land in 1977 were 188 and 68 persons per sq. km. of utilized land, higher than the man-land ratios of the total and rural population to the potentially cultivable land. Two conclusions can be drawn from these ratios; first, there is increased pressure on utilized land from rural population. Secondly, since the difference between the ratio of the rural population to the utilized land is higher than the ratio of rural population to the potentially cultivable land, there exists a possibility of improving the ratio of rural population to the utilized land by expanding the area of agricultural land. This, however, will depend on future government programmes as well as on other aspects, such as the cost of land reclamation and the provision of essential facilities.

As stated earlier, most of the population pressure on agricultural land comes directly from farm population. The ratio of farm population to the utilized land increased from 39.2 in 1958/59 to 69.3 persons per sq. km. of utilized land, i.e. an increase of 76.8 per cent. The compound rate of growth of this ratio was 4.4 persons per sq. km. of the utilised land which is slightly lower than the compound rate of the rural population to utilized land. Nonetheless, the main reasons behind such an increase was mainly the fall in the reported area of utilized land in 1971 (a decline from 30.0 million donums in 1958/59 to 22 million donums in 1971), and secondly, to a real increase in farm population. In fact, farm population increased by 31.5 per cent, whilst utilised land declined by 25.6 per cent for the same period (see Tables 4.7 and 4.2).

The regional pattern of the ratio farm population to the utilized land was one in which the lowest ratio was found in the Northern region both in 1958/59 and 1971. This low ratio is associated with the dominance of wheat and barley cultivation, which does not require intensive labour, and secondly with the availability of arable land. In the Central and Southern regions, permanent crops, multiple cropping, and other agricultural activities on the one hand, and the limited area of cultivable land relative to population concentration on the other, together pushed the ratio of farm population to the utilized land to a higher level (see Table 4.12).

The ratio of agricultural employment to the utilized land increased from 20.6 in 1958/59 to 36.8 persons per sq. km. of the utilized land. The main reasons for this increase and for a pattern of regional distribution of agricultural employment to utilized land ratios are similar to those for the farm population to utilized land ratio.

The effect of the fallow system on man-land ratios was observed when the ratios of farm population and agricultural employment are calculated separately for the arable cultivated land and arable fallow land (see Table 4.12).

Finally, it appears that all forms of man-land ratios increased as a result of real increases in population and a decline in the utilized land. Now, the question is what is the impact of such population pressure on the socio-economic and technical aspects? It could be that such population pressure was a factor in rural out-migration, especially if we consider soil deterioration, the increasing gap between farm and non-farm population incomes (see Table 3.9), in the type and level of technology, such as mechanization, sizes of the holdings, employment, etc. These questions are not central to the theme of this thesis, although their general relevance to matters of production and productivity is obvious.

Many Iraqi economists have believed that population growth, especially of rural or farm population, has been a factor in rapid migration from the rural to urban areas, and in the decline of farmers' income, particularly if the form of utilization is considered.[58,59]

Theoretically speaking, increasing population pressure on existing utilized land may change the form of land utilization or expand the cultivated area. For example fallow land is now rarely found in South East Asia, Europe and some rural areas in West Africa, since, according to this theory, population pressure on land resources will lead to fallow land being reduced if not eliminated (improving land utilization).[60,61,62] Neither such a reduction in fallow nor an expansion of the cultivated area has yet happened in Iraq. This failure either to expand cultivation or to improve land utilization suggests a lack of success in agricultural development as a whole. This failure can also be seen in the lack of infrastructure such as transport and storage facilities in rural areas, deterioration in soil conditions as a result of ineffective irrigation and drainage systems, the relative ineffectiveness of extension and educational services and the high cost of land reclamation.[63] It was clear in Chapter Three that investments in such projects were very limited (see page 60). Inadequate quantitative and qualitative investment meant no improved land utilization or expanding cultivation, and, as a result of that, more under- and unemployment, especially in agriculture, low farm population income, rapid migration to urban areas and finally shortage of foodstuffs, this accompanying the government's adoption of a food import policy to fulfil food shortages rather than creating active food supply. It is clear, already that the problem in Iraq is not population growth but in the lack of improvement in land utilization, improvement which cannot be achieved without real and appropriate investment. Experience in other countries suggests that farm population and, especially, agricultural employment will continue to increase within the near future despite rapid industrialization as in Iraq.[61] It is against this setting of supply of and demand for land that we consider, in the succeeding chapters, various aspects of organisational and institutional changes in agriculture.

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CHAPTER FIVE

LAND TENURE AND LAND REFORM IN IRAQ

5.1 Introduction

It is generally agreed that land tenure has been one of the main obstacles to agricultural development in Iraq.(1) The development of security of land ownership, after all, affects the emergence of other institutional arrangements such as credit facilities, marketing system, short and long term agricultural investment, production, farmers' income, employment, etc.(2)

There are three major objectives in this chapter : the first is studying land tenure systems in Iraq and establishing the facts of spatial distribution. The second is studying land reform in Iraq before and after the 1958 revolution. Both of these are necessary preliminaries to the final objective of examining the impact of land reform implementation on increasing production, and thus on the improvement of farmers' incomes and agricultural employment. Land reform implementation, of course, has various component elements such as introducing HYV's, mechanization and fertilizers, improving plant protection, farming systems, etc., and all input factors and their effect on production will be discussed separately in the following chapters.

5.2 Historical Review

Land tenure in Iraq is a very complex system which reflects the influence of people and the political institutions which governed the country for centuries and sometimes it seems almost impossible to achieve an accurate general classification of land tenure.(3)

Historically speaking, after the Islamic conquest in 641, there appeared two major types of land tenures; *Mulk* (Privately owned) land and *Mawat* (waste or uncultivated) land. (4,5,6,7,8) The first category, however, was subdivided into two categories; Kharaj (Kharajiyah) (tribute tax paying) land and Urhr (Tithe) land.

During the Abbasid period (750 - 1257), apparently there were five types of land holdings in Iraq :[9,10,11]

1. The Caliph's estate, personally owned by the ruler but which could be rented to others for utilization.
2. State owned land (Crown land) which might be granted to civilians or military officers for utilization. [12]
3. *Waqf* (endowment) land which was held in religious trust and which might be rented to others for utilization.
4. Privately owned land.
5. Common land which included roads, rivers, etc.

When the Ottoman rulers occupied Baghdad in 1534 they classified all land tenure into *Miri* (State owned or Crown) land and *Waqf* (endowment) land. [13,14] Within the general category of *Miri* land there had to be acknowledged the practice of individuals holding land with some kind of right of possession. Thus *Mulk* land (as it became known) was held on a usufructuary basis, the occupant paying a land tax to the State in whose hands ultimate ownership - *Miri* - was vested. With time, the right to usufructuary possession became almost permanent, and the holder could sell, mortgage, or transfer the holding to successors. [15,16] Thus the distinction in practice between *Miri* and *Mulk* land became enlarged and, in fact, the land tenure system fell into complete disarray. This was hastened by conflict between the Turkish rulers and the tribes, especially in the Central and Southern regions of the country, who did not recognize the Turkish claim to control all land, and poor administration and the naivety of the Iraqi people who did not know what was going on in the country. The local Turkish appointed governors used to grant land on no clear legal basis and without any proper records, to themselves and to other individuals until, in fact, it became impossible to find adequate land records even for taxation purposes.

When Madhat Pasha came to power between 1869-71, the land tenure system was very confused and he attempted to implement the Ottoman Land Code of 1858 in Iraq. Accordingly, land ownerships in Iraq were classified into: *Miri* (State owned or Crown) land, *Waqf* (endowment) land, *Mulk* (privately owned) land, common land and *Mawat* (waste) land. [17]

His main purpose was to encourage tribesmen to settle by distributing State land to them, which consequently would help to increase the government revenue through taxation, give more control over the tribesmen and reduce the power of the sheikhs. However, implementation of this law was ineffective as the result of several factors such as the tribesmen's fear of further taxation and poor execution of the law itself.[18,19,20,21,22] Later in 1880 the Ottoman rulers issued an imperial law prohibiting any further grants of ownership.[23]

Nonetheless, the hesitation of the tribesmen to seek documentary proof of the right of ownership (*Sanad Tapu*) and their ignorance of opportunities led to Madhat Pasha granting titles of ownership of large estates to sheikhs and city merchants. [20, 21] In the Northern region (Mosul province), land registration, theoretically, was carried out to benefit small holders, but, in fact, many small holders lost their rights later through debts, forced sales and some of them were even issued with fraudulent documents (*Sanad Tapu*). [24]

Between 1883 and 1908, the Ottoman Sultan Abdul Hamid II personally acquired vast productive agricultural land by purchase, gift and reversion of land. [22,23] He appointed a special department called the "Dairat-al-Sannia" under his direct control to administer this estate, estimated in 1913 at 546,200 hectares. [25] After the First World War, this land was considered to revert to state ownership.

When Iraq came under British mandate (1917-32) after the First World War, the idea of land registration had more support. During this period large areas of agricultural land were granted to sheikhs and people who assisted the British.[26] This British policy of "land settlement" had two main elements. First, due to the paucity of land registration documents, many of which were either destroyed during the war or taken away by the Turks, the British relied on a certain number of sheikhs who apparently could control their people, and consequently the country. Secondly, it seems that when registration documents did survive the Ottoman and wartime confusion, they tended to confirm the right of sheikhs and notables. Whenever possible, in order to produce some order between conflicting tribal claims or in general chaos, British administration tended to accept or create any apparently established claim to land by those who had local power and status. This was closely analogous to the recognition of the Zamindari in nineteenth century Bengali land settlement.[27]

Broadly, the most crucial single factor in land tenure in Iraq is the distinction between *Miri* (State) land and *Mülk* (privately owned) land. Both Turkish and British policies were not successful in solving land tenure problems because of their inability to understand the social structure of the local people. For example, granting the right of *Mulk* ownership of land which in fact had never strictly been owned by anyone to sheikhs changed the social structure of the tribal system. Farmers used to have the right to cultivate a plot of tribal land on a usufructuary basis and contributed part of their crops to the sheikhs to cover the tribal expenses. After the grant of land to the sheikhs, tribesmen became tenants of the sheikhs.[28] In general, circumstances during the Ottoman Empire and British mandate helped to establish the control and ownership of large holdings of agricultural land by individuals and families who often felt very little responsibility for the land and the tenants, and who regarded land ownership as the basis of power, especially in the Central and Southern regions of the country as will be seen below.

5.3 Land Tenure System after Independence

After the establishment of the national government in 1921, immediate attention was given to settling the land tenure system in the country. In 1929, Sir E. Dowson was called to Iraq to study the land tenure system and make a full report to the Iraqi government.[29] According to Dowson's recommendation, the government issued the 1932 Land Settlement law which later was replaced by the 1938 Law of Land Settlement. According to this law, land tenure was classified as follows:-[30]

1. *Mulk* (privately owned) Land - this land is owned by the holders or a member of the holder's households. The holders possess the full title of ownership and the right to determine the nature of its use as well as the right of transfer or mortgage. Most of the privately owned land was in the urban areas and very few agricultural holdings were considered strictly to be private holdings; most of the privately owned agricultural holdings were orchards.

2. *Waqf* (endowment) land - this land is held in religious trust, and land cannot be sold or transferred, but it can be rented for utilization. The administration of this land is carried out either by the State Administration or by authorised private individuals.

3. *Miri* (State owned or Crown) land - this is really the most important largest type of land tenure in Iraq, and may be classified into the following sub-types:-

a) *Miri-Sirf* (State owned) land - the right of usufruct of this type is finally in the hands of the government. It includes all agricultural land actually being held by sheikhs, landlords and others who enjoy the usufruct of the land but have not officially been granted the land. Theoretically, such land can be rented or granted for utilization.

b) *Miri-Tapu* (Owner-like) land - this has been granted to the individual owners or group of owners for utilization. The owner has the right to sell, mortgage, bequeath and rent the holding or part of the holding. Proof of ownership may be supplied by documentary or by factual evidence which shows that the land has been productively used by the holder or his predecessor for at least 10 years (during which time no rent was paid), or that it has been planted with trees under certain specified conditions.

c) *Miri-Lazma (Lazma)* land - the 1938 Law decreed that *Lazma* tenure might be granted to any user who could prove enjoyment of the usufruct of the land for fifteen or more years, this right to be lost if the holder failed to use the land productively for four consecutive years. The main differences between *Miri-Tapu* and *Miri-Lazma* land are :firstly,the holder of *Lazma* land had no right to sell his land without written permission from the Land Title Settlement Office. Secondly, the user of *Lazma* land had to pay annual rent. In fact, *Lazma* land was granted to tribesmen whose occupance and use conformed to the necessary minimum periods.

3. Common Land - this includes all other land left for public purposes, such as roads, rivers, parks, etc.

This classification has formed the basis for all subsequent land tenure systems as in Table 5.1 which shows land distribution in Iraq according to the 1952/53, 1958/59 and 1971 agricultural censuses. This table reveals the following points:-

(1) *Miri (Tapu, Lazma* and *Miri-Sirf)* land was the common class of holding in Iraq, e.g. 65.9 and 86.3 per cent of the total reported agricultural land in 1952/53 and 1958/59 respectively, but dropping to 29.6 in 1971. Doreen Warriner has held that from the point of view of English law these tenures should be considered absolute ownership,

since they confirm rights of disposal and inheritance which are subject only to nominal restrictions.[31] But, in fact the government keeps some form of ultimate control. For example, *Lazma* land cannot be sold without written permission from the government, or *Tapu* land can be transferred to privately owned land - *Mulk* - after the government takes between one-fourth to one-third of the total value of the land. These, in fact, are not minor restrictions and in total destroy the concept of such land being in " fee simple" or absolute ownership. It is because of this limitation that the Iraqi state could and can take possession and control of land in this category. Thus the decline of land under *Miri* tenure from over 80 per cent to less than 30 per cent between 1958/59 and 1971 was the result of the implementation of the 1958 land reform law (see below).

(2) Table 5.1 shows that *Tapu* land tenure was the most common type found on land reported as "agricultural" i.e. 39.6 and 38.8 per cent in 1952/53 and 1958/59 respectively, dropping to 13.2 per cent in 1971. Meanwhile, for the reported cultivated area 26.3 and 32.9 per cent was under *Lazma* land tenure in 1952/53 and 1958/59 respectively, dropping to 16.4 per cent in 1971. *Miri-Sirf* land, on the other hand, appeared only in the 1958/59 agricultural census, at which time 14.6 per cent of the agricultural land was under this category. The main reason for the declining area of land in *Miri* tenure in 1971 was related to the implementation of the land reform law of 1958.

(3) *Mulk* (privately owned) land was very small, i.e. 0.8 and 7.2 per cent of the reported agricultural land was considered to be under *Mulk* in 1958/59 and 1971 respectively. This supports the earlier statement that *Mulk* land exists mainly in the urban centres, and this increase between 1958/59 and 1971 was the result of land grants under the Land Settlement law.

(4) Although data on *Waqf* land was first available only in 1958/59, it

Table 5.1 Distribution of Land Tenure in Agricultural Holdings in Iraq (Donums)

Land Tenure	1952/53		1958/59		1971	
	area	%	area	%	area	%
Tapu	10,108,835	39.6	12,481,588	38.8	3,025,911	13.2
Lazma	6,713,224	26.3	10,587,676	32.9	3,761,608	16.4
Miri-Sirf	-	-	4,684,537	14.6	-	-
Total *Miri* Land	16,822,059	65.9	27,753,801	86.3	6,787,519	29.6
Mulk	-	-	257,998	0.8	1,660,754	7.2
Waqf	-	-	439,075	1.4	-	-
Rented land	7,701,967	30.1	-		9,386,868	40.9
Agrarian Law					3,586,277	15.6
Unclassified Land (Unsettled title) land	1,012,013	4.0	3,703,939	11.5	1,523,026	6.7
Total area	25,536,039	100	32,154,813	100	22,944,444*	100

* This total differs from the total in Table 4.1 .

Sources : 1. Ministry of Economics (1954) : Report on The Agricultural and Livestock Census of 1952/53, Baghdad, Iraq, Table 3, p.9, (in Arabic).

2. Ministry of Planning (1961) : Results of the Agricultural and Livestock Census in Iraq for the year 1958/59, Baghdad, Iraq, Table 5, p.9. (in Arabic).

3. Ministry of Planning (1973) : Results of 1971 Census of Agriculture, Baghdad, Iraq, Tables 6 and 6A, pp.28-31.

seems that only a small percentage of agricultural land is considered to be in this category.

(5) It is clear from Table 5.1 that rented holdings are numerically important. They made up 30.1 per cent of the reported agricultural land in 1952/53 rising to 40.9 per cent in 1971, declining thereafter (see also Table 5.10). Rented land is held from two sources, first individuals and secondly the state. Warriner has explained this large proportion of the rented land in 1952/53 by saying that "Rented land refers to *Miri-Sirf* tenure, i.e. land rented from the government. Much of the land classified as 'rented land' is in Maysan (Amarha), where 97 per cent of the land holding is rented under this heading, and where the land is in law *Miri-Sirf*." (32) It seems that Table 5.2 confirms this view.

However, the increase in the percentage of the rented land in 1971 also can be explained by the implementation of land reform law of 1958. Large agricultural holdings were expropriated but, on the other hand, the distribution of land to landless peasants was very slow, as we shall see later. Hence, the government decided to rent this land in small holdings to peasant farmers for utilization until final distribution is carried out (see Table 5.10).

(6) The 1971 agricultural census shows a new form of land tenure which is land owned under the Agrarian Reform Law. Nearly 15.6 per cent of the reported agricultural land was in this category.

5.4 Regional Pattern of Land Tenure

Looking at the provincial distribution of land tenure there appear considerable variations in type of land holding. According to the 1958/59 agricultural census, *Mulk* land was a very small proportion in most of the provinces, except in Basrah where it represented 21.1 per cent. This is particularly associated with regional differences in farming; e.g. in

Basrah, investment in palm-tree gardens and the maintaining of the irrigation canals are characteristic. This also appears relevant in other provinces which showed high proportions of *Mulk* tenure, and where orchards were grown such as Diala, Kerbela and Baghdad with 2.2, 6.33 and 2.68 per cent of the utilized land in *Mulk* (see Table 5.2). *Mulk* tenure, however, also increased by almost six and a half fold by 1971 and Table 5.3 shows the provincial increase in this type of ownership. It appears that the biggest increase in *Mulk* land occurred in the Northern region, followed by the Southern and Central regions respectively. Here, as examined below, the main association is now not with types of farming but with the impact of land reform allocation.

As one might expect *Miri (Tapu, Lazma and Miri-Sirf)* land was the most common type of tenure in all provinces. Table 5.2 shows that this form of tenure consisted of more than 90 per cent of total holdings in every province.

Table 5.3, however, shows a sharp decline in *Miri* land in all provinces but if land rented from the government is considered essentially similar to *Miri* tenure, then *Miri* land tenure becomes even more dominant recently.

Land also can be rented from private owners or *Waqf*. Appendix C, Tables C.1 and C.2 show the distribution of land tenure type in each province in 1958/59 and 1971. It can, generally, be held that the lack of security of land ownership was a major obstacle in agricultural development in Iraq, especially through its effects on agricultural investment. The association between *Mulk* land and the type of utilization in some provinces is probably a very good indicator of variations in investment levels, e.g. high investment rates in areas of perennial crops also held in *Mulk* tenure.

Table 5.2 Percentage of Holdings Under Land Tenure Types According to Provinces in 1958/59

Province	*Tapu*	*Lazma*	*Miri Sirf*	*Waqf*	*Mulk*	Unsettled Land Title	Total
Nineveh	54.79	20.29	23.05	0.9	0.02	0.95	100
Arbil	49.72	32.32	6.74	0.05	0.13	11.04	100
Sulaimaniya	76.01	4.59	11.51	0.03	1.23	6.63	100
Kirkuk	55.07	26.78	15.40	1.98	0.03	0.74	100
Northern Region	56.08	22.35	17.33	0.94	0.16	3.14	100
Diala	36.98	42.22	11.31	7.27	2.22	-	100
Baghdad	8.97	48.07	39.13	1.15	2.68	-	100
Anbar	23.60	68.65	5.99	0.45	1.31	-	100
Kerbela	74.39	17.83	1.07	0.38	6.33	-	100
Babil	37.73	54.41	5.91	1.76	0.19	-	100
Central Region	28.59	47.52	18.24	3.63	2.02	-	100
Wasit	26.80	58.25	14.94	0.01	-	-	100
Maysan	1.65	2.72	95.61	0.005	0.02	-	100
Thi-Qar	44.72	3.55	-	-	0.02	51.71	100
Al-Qadisiya	10.64	76.18	12.89	-	0.004	0.28	100
Basrah	46.67	8.85	12.61	5.89	21.09	4.89	100
Southern Region	22.07	36.69	28.32	0.22	0.77	11.93	100
Total	38.82	32.93	20.97	1.37	0.80	5.11	100

Source : Calculated from Appendix C, Table C.1.

Table 5.3 Percentage of Holdings Under Land Tenure Types According to Provinces in 1971 in Iraq

Province	*Tapu*	*Lazma*	*Miri-Sirf*	*Mulk*	Rented	Owned under Agrarian Reform	Total
Nineveh	12.31	10.46	3.09	9.18	48.46	16.49	100
Arbil	18.76	17.51	1.88	15.65	39.49	6.71	100
Sulaimaniya	8.37	3.05	6.02	28.10	46.16	8.30	100
Kirkuk	19.12	16.87	9.48	2.33	41.04	11.15	100
Northern Region	14.60	12.54	4.59	9.53	45.33	13.40	100
Diala	13.52	23.18	1.73	7.70	50.43	3.43	100
Baghdad	9.72	26.77	9.40	4.75	29.35	20.01	100
Anbar	28.04	33.88	5.03	5.00	18.78	9.27	100
Kerbela	22.33	18.79	16.56	12.40	18.81	11.11	100
Babil	11.98	21.53	8.86	2.82	18.79	36.02	100
Central Region	13.39	24.55	6.47	5.69	33.43	16.47	100
Wasit	13.40	12.63	7.32	1.58	42.16	22.91	100
Maysan	3.67	3.99	7.95	2.73	34.88	46.78	100
Thi-Qar	2.43	6.01	27.13	1.27	46.60	16.56	100
Al-Qadisiya	13.14	41.92	4.49	5.12	26.05	9.28	100
Basrah	13.89	3.66	20.14	20.56	39.79	1.96	100
Southern Region	9.62	17.34	11.68	3.34	37.94	20.08	100
Total	13.19	16.39	6.64	7.24	40.91	15.63	100

Source: Calculated from Appendix C, Table C.2.

5.5 Size of Holdings and Areal Distribution

In addition to tenure but in part associated with it is the important factor of holding size, particularly as background to production and productivity. It is useful to distinguish here two main periods: the first before 1958, the second from 1958 onwards. The main reason for this division is to monitor the effect of land reform on the average size of the holding and land distribution.

Table 5.4 shows the average size of the holdings in 1952/53, 1958/59 and 1971 was 204,127 and 42.5 donums respectively. The sharp decline in the average size of the holding by 1971 mainly resulted from the implementation of the land reform of 1958, but was also partly due to the effect of the Islamic inheritance law, and the land settlement programme.

The provincial distribution of the average size of the holding, Table 5.4, reveals that the Southern provinces, except Basrah, had the largest average size of holding in 1952/53. The main reasons for such large holdings were partly due to unsettled land title in which many individuals and families claimed large areas of agricultural land, and also the grant of large agricultural holdings to individuals and families when land title was settled. In 1958/59, the provincial average size of holdings was less diversified than in 1952/53. Nonetheless, there were one or two provinces which had above average holdings, Wasit for example.

The average size of the holding declined in all provinces by 1971 as a result of the land reform law, but the northern provinces show a slightly larger holding, except in Sulaimaniya (see Table 5.4). The main reason for this is that the land reform laws allocated larger holdings in the rainfed area of northern Iraq than in irrigated lands of the centre and south, as will be seen later. The smallest average holding was reported in Basrah, 7.4 donums in 1971.

Table 5.4 The Average Size of Holding in Iraq (Donums)

Province	1952/53	1958/59	1971
Nineveh	128.0	132.7	75.8
Arbil	131.0	136.0	49.4
Sulaimaniya	61.0	64.2	15.0
Kirkuk	462.0	201.8	72.1
Northern Region	195.5	130.6	53.1
Diala	255.0	168.2	58.7
Baghdad	407.0	286.1	47.2
Anbar	269.0	50.2	26.2
Kerbela	260.0	93.0	16.7
Babil	119.0	43.2	30.5
Central Region	262.0	132.3	35.9
Wasit	1087.0	713.7	59.8
Maysan	6884.0	193.8	17.8
Thi-Qar	709.0	101.7	20.3
Al-Qadisiya	441.0	100.2	36.0
Basrah	25.0	16.4	7.4
Southern Region	1827.4	118.5	28.3
Iraq	204.0	127.0	42.5

Source : 1. Ministry of Economics (1954) : Report on The Agricultural and Livestock Census of 1952/53, Baghdad, Iraq, Table 1, p.7, (in Arabic)

2. Ministry of Planning (1961) : Results of The Agricultural and Livestock Censis in Iraq for the Year 1958/59, Table 3,p.8, Baghdad, Iraq (in Arabic)

3. Ministry of Planning (1973) : Results of 1971 Census of Agriculture, Baghdad, Iraq, Table 6, p.28.

It seems, however, that there is a general relationship between the average size of the holding on the one hand, and the methods of utilization, on the other. The large units in the north related to the domination of arable production (see Table 5.4) and rainfed farming which is recognized by the Land Reform Law. Meanwhile, small holdings are found in some provinces, such as Sulaimaniya, Kerbela and Basrah where tobacco, fruit and dates are grown respectively.

What is important here is not the average size of the holding, but, in fact, the distribution of the holdings among farmers. The size of farms has many socio-economic and technical consequences, i.e. on income distribution, production and productivity, employment and the type and level of technology.(33) On the other hand, the size of farms is also influenced by the availability of land resources, farm population and political policies in the country. (34)

Table 5.5 shows size distribution of agricultural land in three periods. The 1952/53 agricultural census shows that 40.1 per cent of the holdings were less than 20 donums, 47.4 per cent of the holdings were between 20 to 200 donums and 12.5 per cent of the holdings were over 200 donums. Although data on the total area in each category is not available, since 87.5 per cent of the holdings were less than 200 donums one may safely assume that there was a heavily skewed distribution of agricultural land. According to the 1958/59 agricultural census, nearly 57 per cent of the holdings were less than 20 donums and their holders together owned only 2.4 per cent of the reported agricultural land in this census (see Table 5.5).

Table 5.5 shows that 36.1 per cent of the agricultural holdings were between 20 to 200 donums and only 19.0 per cent of the total area in agriculture was in holdings of this size in 1958/59. It is clear that 7.0 per cent of the number of holdings were larger than 200 donums and this group accounted for 78.6 per cent of the reported agricultural land in 1958/59.

It is clear from the previous discussion that there was a most inequable distribution of agricultural land in 1958/59 when there was a very large number of small holdings side by side with a small number of extremely large holdings. This form of inadequate land distribution clearly affected income distribution, especially if one considers the size of the farmers' families, low productivity, the dominance of the fallow system and share cropping. One may therefore assume, under these circumstances, there was high under-employment or seasonal unemployment, low incomes and as a whole it might be considered that a large number of farmers were subsistence farmers. Probably this is another reason for migration from the rural to urban areas (see page 28). Fig. 5.1 shows the Lorenz curve of land distribution in Iraq in 1958/59.

By 1971, there were significant changes in land distribution - Table 5.5. For example 44.6 per cent of the holdings were less than 20 donums and this category covered 7.8 per cent of the reported agricultural land in 1971. Also, it is clear that 53.7 per cent of the agricultural holdings were between 20 to 200 donums and 65.9 per cent of the reported agricultural land was in holdings of this size. The number and total area of agricultural holdings which were larger than 200 donums declined significantly. In brief, the main reason for such changes in land distribution was the implementation of land reform of 1958 in Iraq and Fig. 5.1 illustrates the result by 1971. Comparing the two distribution curves in Fig. 5.1 reveals the improvement in land distribution between 1958/59 and 1971.

Data available on land holding distribution in 1958/59 show that land distribution was in a better position in the Northern region than in

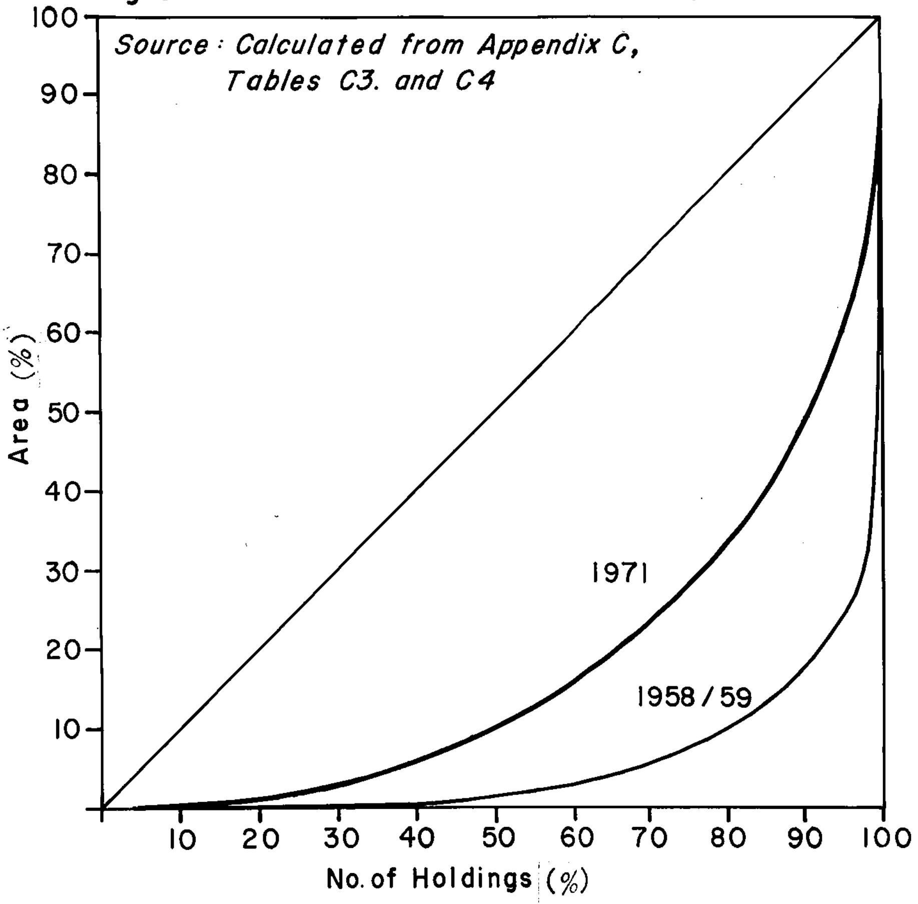
Table 5.5 Size Distribution of Agricultural Land Holdings
(Area in donums)

Period	< 20		20 < 200		200 >	
	Number %	Area %	Number %	Area %	Number %	Area %
1952/53	40.1	*	47.4	*	12.5	*
1958/59	56.9	2.4	36.1	19.0	7.0	78.6
1971	44.6	7.8	53.7	65.9	1.7	26.3

* No date available

Sources : Calculated from Appendix C, Tables C.3 and C.4
Ministry of Economics (1954): Report on The Agricultural and Livestock Census of 1952/53, Baghdad, Iraq, Table 2 , p. 8 , (in Arabic)

Fig. 5·1 LAND DISTRIBUTION IN IRAQ



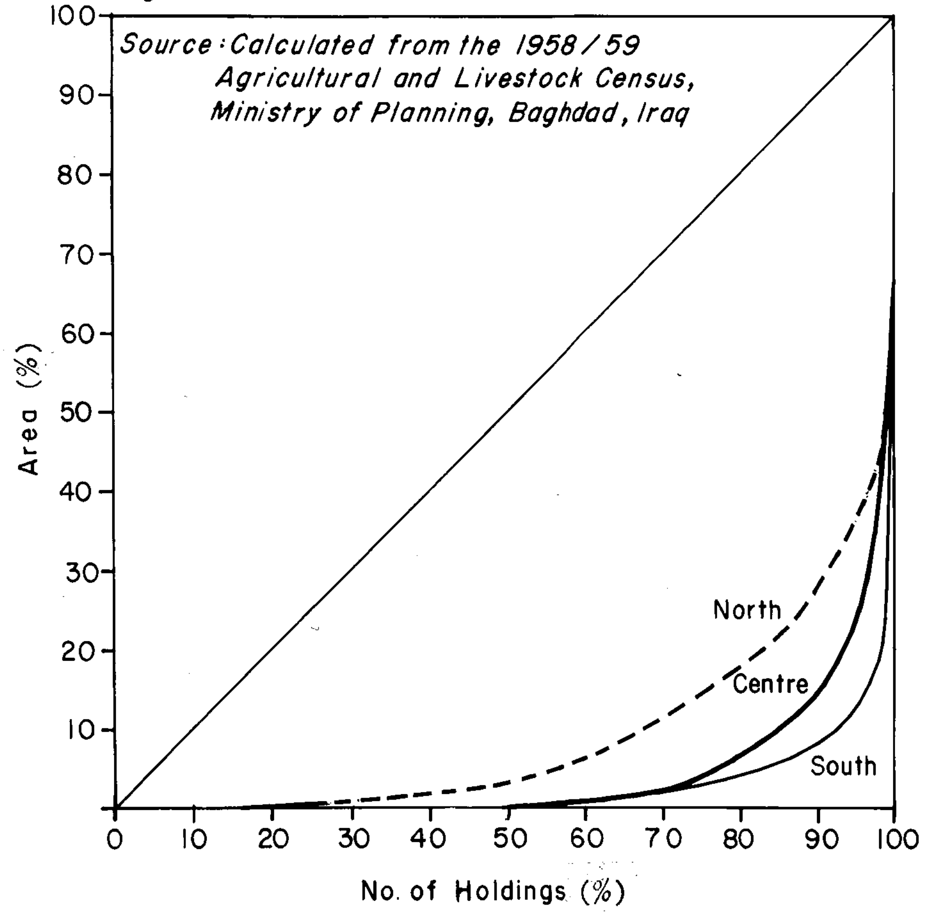
the Southern region where greatest inequality is found. The reason for that is related to special circumstances which were mentioned earlier (see pages 158-160). Fig. 5.2 shows size distribution by regions in 1958/59 in Iraq. Appendix C, Tables C.3 and C.4 show size distribution of agricultural holdings in more detail for 1958/59 and 1971 respectively.

5.6 Land Reform in Iraq

It was clearly demonstrated in the previous section that up to 1950 and more generally up to 1958 large agricultural holdings (Latifundia) existed side by side with small agricultural holdings (Minifundia) in Iraq. This form of land distribution existed as the result of several factors mainly historical and political in nature which led to large areas of agricultural land being under the control of absentee landlords and sheikhs. The main concern of this section is to study land reform in Iraq and its impacts on the political, socio-economic and technical objectives on agriculture as a whole. This study will be considered in two periods; first, from the establishment of the national government in 1921 to 1958 and the second period after the revolution of 1958 and onwards. As we shall see later, 1958 becomes in many ways a critical threshold which affects much of later analysis.

In many developing countries, the implementation of land reform objectives through changing land distribution has become a major aim in any agricultural policy, but, there are also more general objectives such as political, socio-economic and technical.[35,36,37] The achievement of these objectives requires certain measures which may be taken or should be taken in order to improve the structure of the farming institutions or to improve the situation of people involved in agriculture. These measures can involve the direct changing of relations between : farmers and their land, tenants and landlords, and agricultural labourers and employers, or indirectly, but also essential to land reform success, to creating a better

Fig. 5·2: LAND DISTRIBUTION BY REGION 1958/59



rural life in general.[38] The direct measures which are involved in changing land tenure can be classified as follows:-

1. Promotion of land ownership by owner operators and reducing the number of absentee landlords.
2. Regulating rental rates and conditions, and the enactment of lease protection laws.
3. Consolidation into effective sized units of land which is divided into parcels and scattered holdings.
4. Dividing large estates into more efficient production units.
5. Controlling land inheritance to prevent excessive subdivision of holdings or to discourage the accumulation of large estate holdings.
6. Improving the cadastral surveys and the system of title registration.

The indirect necessary measures to produce beneficial effects from the direct technical changes can be summarized as follows:-

1. Improving extension services in the country.
2. Improving cooperative societies.
3. Introducing land taxation and improving the enactment of the taxation law.
4. Introducing HYV's, fertilizers, new crops and cultivation systems through the extension services.
5. Improving the commercial and cooperative marketing systems.
6. Improving credit facilities in general and particularly when inadequate credit availability is a barrier to land reform, especially in the case of land transfers, for example, providing credit to help farmers to buy land.

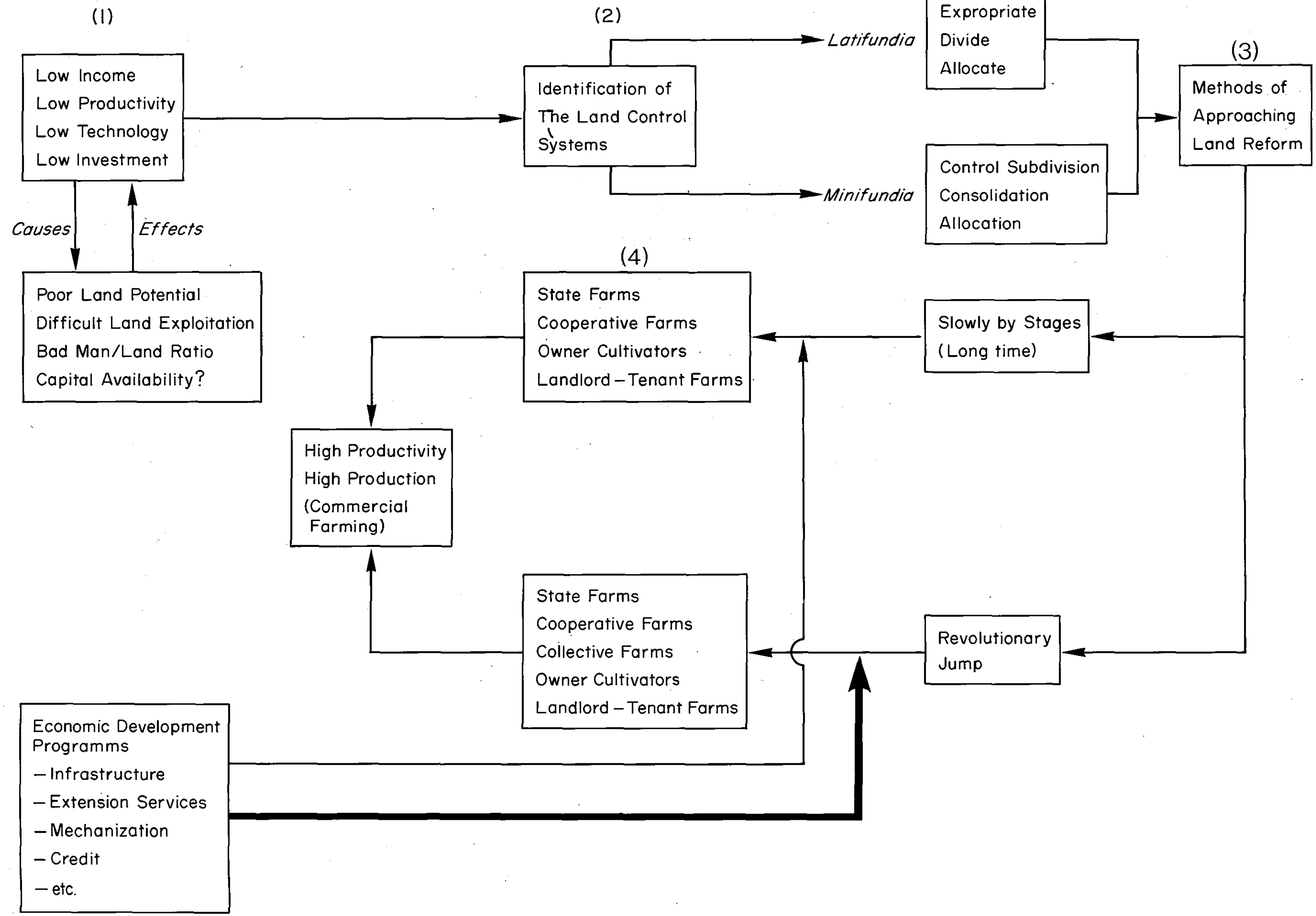
7. Improving the general conditions of rural people, such as better medical and educational services, housing, electricity, water,etc.

Obviously, there are not only strong interrelations between the direct and indirect measures, but, as will appear, they cannot be separated from each other without creating setbacks to agricultural production.

It has already been noted that the implementation of land reform affects the political, socio-economic and technical structure of agricultural institutions. For example, introducing land reform may result in a decline of the political power of the large estate holders. The economic impacts may be the increasing and improving of farmers' incomes, increasing agricultural production, improving capital formation through private and public sectors and improving utilization of the labour force. The technical impacts come through introducing HYV's, pesticides, herbicides, mechanization, extension services, etc.

Fig. 5.3 schematically represents elements and stages in land reform implementation. The first stage is required to identify the needs for land reform.(39) The second stage is identification of the land control systems. The third stage involves the choice of methods of approaching land reform - either slowly by stages, as in many developed countries, or by a revolutionary jump as in the case of most developing countries such as Egypt, Iraq and some Latin American countries. The final stage is the hoped-for results of land reform. Fig. 5.3 also indicates the importance of the indirect measures for the success of land reform, especially in the case of a revolutionary jump approach, and this forms the basis for later chapters.

Fig.5·3 THE CRITICAL PATH ANALYSIS OF LAND REFORM



Several projects were established between 1952-1958 throughout the country. Fig. 5.4 shows the locations of these projects and Table 5.6 adds further information covering these projects. Through these projects the government tried to provide the new settlers' families with better social and medical services, credit facilities and better extension services. The size of the holding was decided on the basis of irrigation method; the largest holdings were in the rainfed area (see Table 5.6).

Unfortunately, some of these agricultural projects suffered from many setbacks for various reasons:-[46, 47, 48, 49,50]

1. The influence of the sheikhs, who were members of the parliament, distorted government policy. For example, in Dujaila project two-thirds of the new land and associated perpetual water rights were given to the sheikhs in the area of the projects.

2. Projects were established without good infrastructural facilities in the settlement projects, such as transport, storage, etc. Drainage improvement in irrigated areas was hardly provided and this caused high soil salinity in several project areas. Many settlers left the projects (Dujaila, for example) due to this trouble.

3. Input factors such as HYV's, fertilizers, pesticides, herbicides, and farm machinery were not well provided.

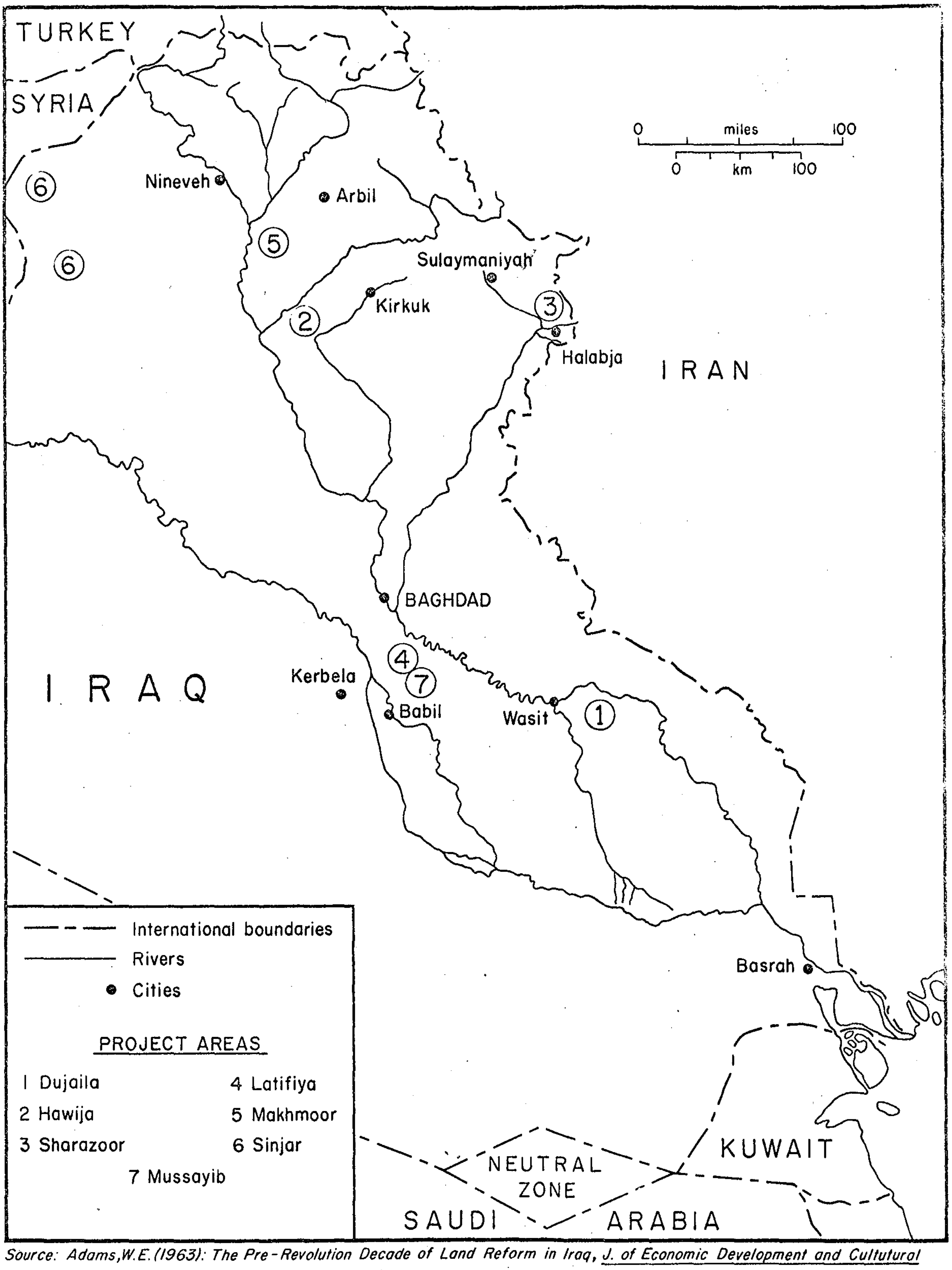
4. Extension services were very poor.

5. Credit facilities were very limited. The maximum credit extended to the farmers was I.D. 100 per farmer. Most of the settlers had financial problems, and later the government had to adopt wider supervised credit measures.

6. Poor selection of settlers such as retired police and military officers, civil servants and graduates from agricultural schools.

7. The difficulties of breaking through traditional farming systems. For

Fig 5·4 LAND SETTLEMENT PROJECTS BEFORE 1958



Source: *Adams, W.E. (1963): The Pre-Revolution Decade of Land Reform in Iraq, J. of Economic Development and Cultutural Change, Vol. XI, No. 3, Part I, pp. 267–88*

Table 5.6 *Miri-Sirf* Projects in Operation in 1957

Name	Date opened	Size of the Projects (Donums)	Units distributed	Size of the Units (Donums)
Dujaila	1945	250,000	1,540	100-200
Hawija	1950	37,650	462	70
Shahrazoor	1951	32,500	380	70
Latifiya	1952	25,000	442	50
Makhmoor	1953	7,200	100	68.6
Sinjar	1956	1,000,000	935	150-300
Massayib	1956	303,000	431	66
Total		1,655,350	4,290	

Source : Gabbay, R. (1978) : Communism and Agrarian Reform in Iraq, Croom Helm, London, Table 1.6, p.38.

example, it was not easy to settle the nomadic people permanently in the new agricultural projects, whilst in other cases introductory rotation systems were not successful.

8. The traditional conflict between tribes made life in many new projects rather difficult.

9. Government bureaucracy was another factor in the failure of these projects. The Commission of the MSLD suffered from repeated transfers from one ministry to another.

10. Above all, when the country had enough capital and needed technical rather than financial aid, such aid was not effectively applied or utilized. Several nations and international organizations such as U.K., U.S.A., F.A.O., W.H.O., UNESCO, were all involved in the MSLD projects and this complicated rather than strengthened technical assistance. Different views led to poor cooperation between these organizations and consequently caused considerable waste and inefficiency in technical fields.

Although it seems that MSLD was a genuine attempt to establish medium size owner-operator farmers, the characteristics of government policy and all the socio-technical factors associated with it prevented the MSLD from achieving success. This experience illustrates the importance of integrated backup and supportive measures (the indirect measures mentioned on page 177) for the success of new agricultural settlement projects or other major institutional policies.

5.8 Land Reform After the 1958 Revolution.

This is the second period of land reform in Iraq. The main characteristic of this period is that land reform was approached by a revolutionary jump. So far there have been three main land reform laws; Law No.30 of 1958, Law No. 117 of 1970 and finally Law No.90 of 1975, this last dealing specifically with the autonomous region of Kordistan.(51) The purpose of this section is to briefly review land reform laws in Iraq and to study some of their impact on agriculture.

There were four main sections in the first land reform law. The first imposed ceilings on the size of agricultural holdings and with land distribution. The second dealt with the establishment of cooperative societies. The third dealt with re-organizing landlord-tenant relationships and the fourth dealt with organizing agricultural labour forces. This land reform law, however, was little more than a copy of the Egyptian land reform of 1952 with minor modifications.[52]

The main concepts of this law can be briefly summarized as follows:-

1. The maximum ceiling of the private ownership was set at 1,000 donums (250 hectares) in the irrigated areas and 2,000 donums (500 hectares) in the rainfed areas. Companies or societies were excluded from this limitation.

2. Areas beyond these limitations were to be expropriated within five years, later amended to ten years. The sequestration of land was started with the largest holdings based on returns required by government from landlords declaring the size of land under their control.

3. The expropriated land had to be redistributed to landless peasants. Priority was given to the utilizer of the holding followed by the largest family in the area, and the poorest family, and consequently distribution could be made to farmers outside the area concerned. The size of the distributed holdings was 30-60 donums (7.5-15 hectares) in the irrigated areas, and 60-120 donums (15-30 hectares) in the rainfed areas.

4. Compensation payments were made to landlords, calculated on the basis of land productivity, irrigation methods, investments on the holdings and the relation between landlord and tenant who enjoyed the usufruct of the land. The landlord was entitled to two-thirds of the compensation and farmers or tenants to one-third, unless there was a special agreement between

the landlords and tenants. Further allowances were made to the landlord for farm machinery or building on the holding. Therefore, if the holding was *Miri-Tapu* or *Miri-Lazma*, a reduction between one-fourth to one-third was made in the compensation according to Law No. 61 of 1956 and Law No.40 of 1952. (53) Compensation could be made in cash if it was less than I.D.1000, or to be paid for in bonds bearing annual interest at 3 per cent and redeemable in 20 years.

5. Beneficiaries got their holdings free of all liens and ties and were allowed to obtain the right of title (freehold) without any payment of fees. They had to pay the value of their holdings as decided for them by the Distribution Committee in the districts, plus full value of trees, machines and buildings on the holding, plus 5 per cent interest, plus 15 per cent to cover the cost of administration and distribution expenses.

6. Beneficiaries were required to join a cooperative society in their region. These cooperative societies were supposed to supervise production, provide credit, market production and improve social welfare. Management of the cooperative was under government supervision, i.e. the manager was appointed by the government.

7. The landlord-tenant relationships were organized thus: first, the lease must not be less than three years. Secondly, there must be a written agreement between landlords and the tenants. Thirdly, landlords must provide water to holdings, whilst the farmers provided seeds, fertilizers and all the production requirements. Fourthly, the landlord's agent or intermediary was abolished. Fifthly, management of the land was left to the landlord if he provided water, otherwise it was left to the farmer. Sixthly, the farmers' shares of the produce was 55 per cent in pump-irrigated areas, 65 per cent in flow-irrigated areas and 75 per cent in the rainfed areas.

Two committees were set up, the first to administer expropriated land, distribution and setting up cooperative societies in the land reform areas, as well as to supervise them,and the second was set up to determine the minimum wages of agricultural workers in each province.

According to government figures, there were 3,418 landlords owning 15.8 million donums of agricultural land in 1958, whilst it was estimated that there were half a million families who did not own land. [54.55] It was argued that with this scale of inequality of land distribution, land reform in a revolutionary form was the only solution.

The government legislated the Land Reform Law No. 117 of 1970 to overcome the shortcomings of the previous law. The main features of this law are:-

1. The ceiling on agricultural holdings ranges from 1,000 donums (250 hectares) in the infertile rainfed area south of the 400 mm. precipitation line to 40 donums (10 hectares) in flow-irrigated lands cultivated with tobacco in the northern provinces. This law provides fifteen categories of holding limitations under which the area of agricultural land owned by any person or alienated to him under long term tenure, *Lazma* or *Tapu*, would not exceed these limits.[56] Fruit and palm tree groves were excluded from this limitation.

2. Land distribution can be made to peasants, both individually and collectively on the basis of irrigation methods, land fertility and type of crop. The size of the distributed holding ranges from 200 donums (50 hectares) in the infertile land south of the 400 mm. rainfall line to 4 donums (one hectare) in flow-irrigated land and cultivated with tobacco in the northern provinces. Altogether there are fourteen size categories.[57]

3. In the new land reform law, landlords have no right to choose the

land allocated to them.

4. Compensation was abolished and distribution of land was made without any payment by the beneficiaries.

In addition, the new land reform law also covers other aspects such as the productive relationship between landlords, tenants and agricultural workers, with emphasis on the cooperative societies and farmers' union, etc.

The third land reform law is Law No.90 of 1975. This law deals with agricultural land under the autonomous rule of Kordistan. The main component in this law is the establishment of maximum limits of land ownership in this area, ranging between 500 donums (125 hectares) to 40 donums (10 hectares) according to irrigation system, land productivity and cultivation. Land distribution remained without any other changes to the Land Reform Law No. 117 of 1970. (58)

5.9 The Outcome of Land Reform in Iraq Since 1958

We have already stated that land reform has several objectives, political, socio-economic and technical. These objectives should be evaluated in the context of the whole socio-economic development of the country. Evaluation of land reform, therefore, can be approached as a matter of short term achievement or failure of specific objectives, or in the longer term achievement of balanced ultimate objectives. (59)

Since the objective of this study is to consider all the major groups of factors affecting agricultural production and productivity so that we can examine the relative significance of climate and weather, some aspects of land reform must be briefly evaluated here, such as political impacts, land expropriation and distribution and their impact on the factors which influence agricultural production. As for other associated measures, for example, increasing productivity through introducing HYV's, mechanization, plant protection, extension services and irrigation and drainage facilities, these will be discussed separately in the following chapters.

5.9.1 Land Expropriation

According to one official source, the total expropriated land was nearly 11.0 million donums (2.75 million hectares) by the end of June 1977, and probably this figure is now higher. (60) Table 5.7 however, shows the published figures for expropriated agricultural land until the end of 1975. It appears from this table that land expropriation was relatively slow during the period between 1958 and 1970 compared with the period 1970 onwards, i.e. only 40 per cent of the total land expropriated up to 1975 occurred between 1958 and 1970. This might suggest that there were some problems associated with the implementation of the land reform law during 1958-70. Some of these difficulties were the absence of statistical data and cadastral surveys, legal and technical problems and finally from government administration and bureaucracy. (61, 62) It seems so far that land expropriation was not completely carried out by mid 1977, if we assume that 16 million donums was an accurate estimate of the total area subject to expropriation according to the Law No. 30 of 1958, and this figure must have been raised by Law No. 117 of 1970 in which the maximum size of holding was reduced.

As Table 5.7 shows, 70 per cent of the total expropriated agricultural land was in the Central and Southern regions mainly due to the preponderance of large agricultural estates in these regions. The provincial distribution of expropriated land reveals that Wasit province had the largest expropriated area, whilst Maysan had the smallest expropriated area. These variations are the resultant of all the forces, socio-political, technical - e.g. farming type - institutional, etc. considered earlier in this chapter.

Table 5.7 Total Expropriated Land up to 1975 by Province (Donums)

Province	Area Sequestrated in compliance with Law No.117 of 1970 up to 31.12.75.	Area Sequestrated in compliance with Law No.30 of 1958 up to 31.5.70	Total Area
Nineveh	707,566	469,139	1,176,705
Arbil	424,952	162,428	587,380
Kirkuk	755,730	197,904	953,634
Sulaimaniya	287,490	137,142	424,632
Northern Region	2,175,738	966,613	3,142,351
Baghdad	26,585	502,589	529,174
Diala	581,944	422,773	1,004,717
Anbar	24,362	66,495	90,857
Babil	190,456	345,370	535,826
Kerbela	99,414	55,539	154,953
Central Region	922,761	1,392,766	2,315,527
Wasit	428,261	1,356,824	1,785,085
Al-Qadisiya	450,362	386,460	836,822
Thi-Qar	1,515,566	-	1,515,566
Maysan	25,169	53,502	78,671
Basrah	612,820	33,342	646,162
Southern Region	3,032,178	1,830,128	4,862,306
Grand Total	6,130,677	4,189,507	10,320,184

Source : Ministry of Planning : Annual Abstract of Statistics, 1975, Baghdad, Iraq, Table 3/29, p.93.

5.9.2 Land Distribution

The net distributed agricultural land was 8.6 million donums (2.15 million hectares) by the end of June 1977.[63] This means that land distribution lagged behind land expropriation. The number of land reform beneficiaries was 260,958 farmers up to the same date.[64] Table 5.8 shows annual land distribution and the number of beneficiaries between 1959 and 1975. It appears from this table that up to 1970, land distribution was relatively slow, except in some individual years. It seems that only 29 per cent of the total number of beneficiaries received land between 1959 and 1970.

Slow land distribution during 1959-70 could be related to the same problems associated with land expropriation. The need for providing essential services, such as irrigation and drainage facilities, caused further delays.

According to the available statistics, the average size of the distributed holdings was 33 donums (8.25 hectares) in 1977. Table 5.9 shows the average size of the holding in each province as well as for the whole country in 1975. The average size of the holding in 1975 for the whole country was 36.8 which was slightly higher than the average size of the holdings in 1977. Furthermore, this table reveals that the largest distributed holding was in Nineveh province (72.1 donums), whilst the average size of distributed holding in Kerbela province was 13.3 Variation in the size of holdings can be related to two factors : first, the type of land utilization, such as orchards in the case of Kerbela and Basrah provinces, tobacco and rice in the case of Sulaimaniya and Maysan provinces respectively; the Land Reform Law of 1970 made land distribution according to land utilization very clear. The second reason affecting the size of distributed agricultural holding is the irrigation method. The average holding in the rainfed area is twice the average holding in the irrigated area, and Table 5.9 shows the difference between the average size of the

Table 5.8 Distribution of Lands and Number of Beneficiaries Between 1959-1975

Year	Distributed Area (Donums)		Total Area	No. of Beneficiaries
	State Land	Sequestrated Land		
1959	36,900	-	36,900	615
1960	59,504	223,925	283,429	7,393
1961	198,305	293,726	492,031	9,460
1962	67,876	569,647	637,523	11,170
1963	203,618	177,161	380,779	6,779
1964	149,532	267,452	416,984	9,599
1965	27,830	52,852	80,682	1,984
1966	26,771	55,422	82,193	2,340
1967	60,156	81,281	141,437	3,290
1968	149,402	73,846	223,248	3,183
1969	54,005	166,673	220,678	3,585
1970	230,793	131,334	362,127	15,138
1971	429,634	171,409	601,043	17,235
1972	191,593	211,016	402,609	12,968
1973	315,702	546,164	861,866	35,040
1974	331,012	282,553	613,565	23,866
1975	146,767	163,727	310,494	11,308

Source : Ministry of Planning : Annual Abstract of Statistics, 1975, Baghdad, Iraq, Table 3/32, p.96.

holding in the Northern province (rainfed area) and the rest of the country.

Due to the difference between the areas of land expropriation and distribution, a new form of land tenure appeared. This new form of tenure was land temporarily under the control of the Ministry of Agrarian Reform. Usually these lands were rented on annual terms to farmers for utilization. Table 5.10 shows the total agricultural land under government control between 1967 and 1978 which was rented to farmers for utilization. This table shows that the total area under government control grew between 1967 and 1972 and started to decline after that as land distribution was speeded up.

It is obvious from Fig. 5.1 that land distribution equality improved after the implementation of land reform in Iraq. The consequent question is how much did land distribution affect agricultural production, income distribution, employment, private investment, etc.? It is not possible to analyse all these aspects in full detail in this study, but brief answers can be made to some of the relevant questions.

It is agreed that agricultural production as a whole or for particular major crops such as wheat, barley, rice and cotton, declined after the implementation of the 1958 Land Reform Law, and the production level remained below the 1958 level for several years. (see Table 5.9)[65,66,67] This decline in production was caused by uncertainty, in terms of investment, land tenure, land distribution, felt by the original landlords and tenant farmers and also the new land reform beneficiaries. Furthermore, it can be argued that unfavourable weather conditions during this period, namely drought, were to blame as well. Therefore, considering the increase in government agricultural investment (see Table 3.3), agricultural production was below the planned target. In other words, if there was a real increase in agricultural production, this increase was not enough to meet the increasing demand caused by increasing population and per-capita food consumption. The increase in the value of imported food

Table 5.9 Total Distributed Lands and Number of Beneficiaries from the Beginning of the Land Reform Law up to 31.12.75 by Province

(Donums)

Province	No. of Beneficiaries	%	The Distributed lands		Total distributed area	%	Average size of the holding
			Irrigated	Rainfed			
Nineveh	24,864	14.7	21,205	1,772,444	1,793,649	28.8	72.1
Arbil	8,619	5.1	5,887	511,926	517,813	8.3	60.1
Kirkuk	13,560	8.0	99,273	670,577	769,850	12.4	56.8
Sulaimaniya	5,786	3.4	39,557	72,026	111,583	1.8	19.3
Northern Region	52,829	31.2	165,922	3,026,973	3,192,895	51.2	60.4
Baghdad	14,726	8.7	405,233	50,671	455,904	7.3	31.0
Diala	4,460	2.6	146,645	31,838	178,483	2.9	40.0
Anbar	2,368	1.4	46,257	142	46,399	0.7	19.6
Babil	12,894	7.6	374,939	-	374,939	6.0	29.1
Kerbela	3,464	2.1	46,089	-	46,089	0.7	13.3
Central Region	37,912	22.4	1,019,163	82,651	1,101,814	17.7	29.1
Wasit	19,095	11.3	721,404	-	721,404	11.6	37.8
Al-Qadisiya	11,043	6.5	290,504	-	290,504	4.7	26.3
Thi-Qar	19,403	11.5	450,689	-	450,689	7.2	23.2
Maysan	26,591	15.7	441,043	-	441,043	7.1	16.6
Basrah	2,297	1.4	33,337	-	33,337	0.5	14.5
Southern Region	78,429	46.4	1,936,977	-	1,936,977	31.1	24.7
Total	169,170	100	3,122,062	3,109,624	6,231,686	100	36.8

Source: Ministry of Planning, Annual Abstract of Statistics 1975, Baghdad, Iraq, Table 3/31 p.95.

Table 5.10 Land Temporarily Directed By Ministry of Agrarian Reform and Rented to Farmers

Year	Area (Donums)	No. of Beneficiaries	Average size of Holdings (Donums)
1967	6,881,269	189,146	36.4
1968	7,088,939	205,945	34.4
1969	7,976,377	223,855	35.6
1970	8,658,423	236,203	36.7
1971	9,081,511	242,377	37.5
1972	9,119,861	238,691	38.2
1973	7,900,008	226,296	34.9
1974	7,057,103	199,425	35.4
1975	5,086,170	172,600	29.5
1976	3,679,292	115,972	31.7
1977*	3,470,632	106,087	32.7
1978**	2,860,060	79,700	35.9

* end of June 1977.
** end of April, 1978.

Sources: Ministry of Planning : Annual Abstract of Statistics, 1970, 1971, 1972, 1973, 1974, 1975 and 1976, Baghdad, Iraq.

Faraj, S.M. (1978) : Agricultural Price Policy and its effects on the Income of Agrarian Reform Beneficiaries, F.A.O. p.5.

Alwan, A.S. (1978) : The Involvement of the Poor in Development Through Rural Organization in Iraq, F.A.O., Table 5, p.19.

further supports such conclusions (see Table 3.14). It seems that the land reform administration failed to rapidly fill the gap which was left by the displaced landlords or other institutions in providing essential services to farmers, for example credit, seeds, water pump machines, etc. Moreover, the land reform administration also failed to increase agricultural productivity through the planned new input package, i.e. HYV's, fertilizer, machinery, plant protection, etc., as we will see later.

As far as farmers' income is concerned, it is true to say that farmers' income increased to a certain extent (see Table 3.9).[68] Land reform regulated the relation between landlords and tenants and agricultural workers in terms of shares and wages. Some land reform beneficiaries do not have to pay any rent or share their produce, whilst some do have to pay rent to the government. Input factors were and are heavily subsidised by the government (see page 85). Finally, relative price increases were obtained for their agricultural products. All these factors positively affected an increase in farmers' incomes. Faraj argues that the true situation is that the basic burden in increasing farmers' incomes is borne only by prices, whilst it should have been possible to achieve large increases in farmers' incomes through increasing productivity per donum without increasing prices. He also maintains that because of the relative inflation which the Iraqi economy is suffering, the continuous increases achieved in farmers' incomes were not equivalent to increases in real incomes.[69]

We noted earlier that agricultural employment increased from 1.6 million in 1958/59 to 2.11 million in 1971. This increase in employment may have been partly caused by land reform measures. Nonetheless, other evidence available, such as the decline in agricultural employment by 1977 (see page 34), the rapid increase of migration from rural to urban areas, especially after the 1973 oil price increase, makes one doubt whether land reform has in fact increased employment opportunities in rural areas.

Here, one may therefore assert that the economic objectives of land reform were not adequately achieved since the increase in agricultural production has not been large enough to match the increasing demand, since farmers' incomes have relatively increased only as the result of pricing policy and not through increasing productivity, and since there is very much doubt whether land reform has increased employment opportunities in the rural areas. On the other hand, land reform in Iraq apparently has achieved two other objectives: first, the political one by eliminating the power of the landlords and sheikhs, and secondly, the social objective by freeing the peasant farmers from the harsh pseudo-feudal system and by distributing land to them.

5.10 Conclusion and Final Remarks

According to the Ottoman Land Code of 1858, land tenure in Iraq was classified into *Miri* (State owned) land, *Mulk* (privately owned) land, *Waqf* (endowment) land, common land and *Mawat* (waste) land. Between 1869-71, Madhat Pasha failed in an attempt to implement this law in Iraq because of the suspicious attitude of the Iraqi people towards the Turkish rulers. The actual outcome of events was the registration of large agricultural estates in the names of a few tribal sheikhs and city merchants.

During the British mandate, land registration or land settlement had a broadly similar effect. Large agricultural estates were registered to individual tribal sheikhs and notables. Apparently, the main reasons for that were the absence of adequate land records and secondly, when such records survived the wartime confusion, the British administration confirmed these rights.

The pseudo-feudal land tenure system appeared as the result of such land registration.[70] Large agricultural estates (Latifundia) apparently existed side by side with small holdings (Minifundia) until 1958 when land reform was introduced to the country. Earlier policies were not very successful in that land registration changed for the worse the relationship between tribesmen and their sheikhs. Before land registration, tribesmen had the right to cultivate a plot of tribal land and pay some of their produce to the sheikhs to cover tribal expenses. But, after land registration, tribesmen became tenants of the sheikhs.[71]

The national government legislated for land settlement in 1933 and in 1938. Land tenure according to this latter law was classified into : *Mulk* (privately owned) land, *Waqf* (endowment) land, common land and *Miri* (state owned) land. The last form of tenure, however, has to be divided into : *Miri-Tapu* (owner-like) land, *Miri-Lazma* land and *Miri-Sirf* (state owned) land. The difference between *Miri-Tapu* and *Miri-Lazma* is that in the latter type the user had to pay tax (rent) to the government and had no right to sell without written permission from the government.

Until 1959 it seems that *Miri* land *(Tapu, Lazma* and *Miri-Sirf)* was the most common type of ownership (see Table 5.1). This form of ownership declined to nearly 27 per cent in 1971. The main reason for that was land expropriation which followed the implementation of land reform in 1958.

Mulk (privately owned) land, on the other hand, increased by 1971. There was a significant correlation between *Mulk* (privately owned) land and the type of land utilization. Most of the privately owned agricultural land was orchard or agricultural production systems requiring large investment.

The size of the agricultural holding declined from 204 donums (51 hectares) in 1952/53 to 42.5 (10.6 hectares) in 1971. These changes occurred as a result of land distribution, especially after 1958. Generally speaking, it appears that there is an obvious relation between the average size of the holding on one hand, and land utilization and irrigation on the other. The average size of holdings is larger in the rainfed areas than in the irrigated areas (see Table 5.4). The provincial distribution of the average size of the holding reveals that the average size of the holding is small where orchard, dates and tobacco production dominate agricultural activities in provinces such as Kerbela, Basrah and Sulaimaniya. The Land Reform Law No.117 of 1970 further recognised the relation between the size of the holding, land utilization and irrigation methods in terms of land expropriation and distribution.

Land distribution was inequitable and inadequate for high productivity according to the 1958/59 agricultural census, i.e. 56.9 per cent of the holdings were less than 20 donums and this group represented only 2.4 per cent of the total reported agricultural land, whilst 7 per cent of the holdings were larger than 200 donums and covered nearly 80 per cent of the total reported agricultural land. The regional distribution of agricultural land shows the Southern region had the most unequal land distribution in the country. Nonetheless, land distribution improved after the implementation of land reform in Iraq in 1958 (see Fig. 5.1).

The second objective of this chapter was to study land reform in Iraq. Basically, land reform requires two sets of measures : direct and indirect (see Fig. 5.3). The direct measures mainly deal with land ownership, land consolidation and distribution and regulating the relationship between the landlord and tenants or agricultural workers. The indirect measures deal with improving agricultural production and productivity, i.e. extension services, credit facilities, introducing new packages of input factors, etc., and also deal with the more general concerns of rural people. A schematic model was suggested to identify the need of land reform and the steps to approach it (see Fig. 5.3).

Land reform in Iraq was approached in two ways; slowly by stages before the 1958 revolution and by a revolutionary jump after that. Before the 1958 revolution, the government encouraged agricultural settlement projects. Several projects were established throughout the country. There were many problems associated with these agricultural projects. These problems could be grouped into political, socio-economic and technical (see page 181). Therefore, it is argued that this approach to land reform was too slow to achieve any socio-economic benefits for the poor peasant farmers in Iraq and was probably also expensive.[72, 73]

After the 1958 revolution, the main task of the new authorities was to provide socio-economic justice to the Iraqi people. In that sense, the government legislated land reform No.30 of 1958, followed by law No. 117 of 1970 and law No. 90 of 1975. Basically, all these laws aimed at setting a ceiling on holding sizes, land distribution, improving relations between landlords and tenants or agricultural workers and establishing farm organizations and agricultural cooperative societies.

It was estimated in 1958 that more than three thousand landlords owning more than sixteen million donums were subject to land expropriation. Statistical data suggest that only 11 million donums were expropriated by mid 1977. This means that after nearly 20 years, land reform had not by then completed land expropriation. In fact, land reform implementation was very slow before 1970, i.e. only 40 per cent of land expropriation occurred between 1958 and 1970.

Land distribution was carried out very slowly, especially before 1970 (see Table 5.8) because of many problems associated with the implementation of land reform such as a statistical data base, legal and technical problems and administrative inefficiency.

Due to the difference between land expropriation and distribution, a new form of land tenure appeared. This land was under the temporary control of the agrarian authorities which was leased or rented annually to farmers, jointly or individually, for utilization.

It has already been mentioned that land reform has several objectives, i.e. political, socio-economic and technical and it appears that the Iraqi land reform achieved its political and social objectives in that the political power of the landlords was destroyed and peasant farmers, freed from the control of pseudo-feudal system, obtained holdings to own or rent from the state.

It also seems that land reform did not achieve the economic objective very adequately. Agricultural production declined after the introduction of land reform for several years and although it recovered later, it did not increase enough to match the increase in demand for food which resulted from population growth and increasing per-capita food consumption. Farmers' incomes increased almost entirely as a result of pricing policy and not from increasing agricultural productivity. The trends in agricultural employment are not very clear; it increased between 1958/59 and 1971 and later showed a sharp decline in 1977. There remains a steady migration from rural to urban areas which is a strong indication that the economic objective has not been as successfully achieved as the Iraqi agricultural policy makers hoped.

In the context so far established we now turn to evaluate the organisational, institutional and technical factors which even greatly influence agricultural production and productivity.

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CHAPTER SIX

AGRICULTURAL COOPERATIVES AND EXTENSION SERVICES

6.1 Introduction

There is general agreement that farmers cooperatives and other farmers' organizations can play a vital role in the dynamic process of adjusting the structure of agriculture as well as their importance in promoting general socio-economic progress by encouraging thrift, providing credit, marketing and supplying consumer services.(1)

It was emphasised in the previous chapters that land reform beneficiaries in Iraq are obliged to join cooperatives. The purpose of this chapter is to study the success of agricultural cooperatives, primarily as farmers' organizations, in providing managerial services to their members after the disappearance of the landlords, i.e. providing credits, current material inputs, farming equipment and technical skills.

It appears appropriate also to evaluate the extension services here, even though, and as shown in Fig. 1.1 such services are most often regarded as technological in type. The main reasons for this are as follows. First, the linkage between cooperative and extension services is strong, especially in Iraq where both of them are government responsibilities. Secondly, the success of each of them often depends on the parallel success of the other. Thirdly, since extension services may be considered in a development context as an important method of introducing new technology in agriculture,they form a useful bridge between the institutional factors considered up to this point and the technical factors which are the main elements in the following chapters of this thesis.

6.2 Theoretical Aspects

A cooperative society is defined as an organization based on self-help and aimed at increasing the maturity and sophistication of socio-economic behaviour, regardless of whether it is a voluntary or compulsory organization. [2,3,4] In this sense, cooperative societies may be characterized by farmers' behaviour based on common interest, joint action and the establishment of and the carrying out of business in a cooperative manner. [5.6]

Cooperatives can be established in both rural and urban areas as soon as a group of people join together to establish a cooperative to serve either a specific or multi purpose end; in either case to promote the socio-economic conditions of its members. [7,8] In any agricultural system which involves farmers who have some independent freedom of action, the application of different forms of cooperative appears essential to solve these problems associated with agricultural production and to accelerate the development of agriculture, especially in developing countries.[9]

The type and organization of cooperatives depends on several and varied factors, social, economic, educational, political, the land tenure system, etc., and there is no single rule of thumb covering the establishment of cooperative organization. [10,11] For example, some countries such as Egypt and Iraq have chosen compulsory cooperatives after introducing land reform, whilst others used voluntary cooperatives, for example Italy. Each policy has certain advantages and disadvantages. Compulsory cooperatives may flourish, but on the other hand, may lead to inefficiency, corruption and a reduction in local interest. [12,13] Moreover, it is argued that cooperatives on a voluntary basis may be difficult to introduce in some situations because of illiteracy and because most farmers do not understand a money economy.[14] The degree of government involvement in cooperative organization raises other questions. In most developing countries, agricultural cooperatives rely on government assistance for providing credit facilities, management and supervision, since without such aids, these cooperatives cannot work. Nonetheless, too much government involvement may spoil the growth of farmers' initiative and responsibility and this will not help cooperatives to stand on their own feet.

The degree of success or failure seems ultimately to depend on the honesty and loyalty of members, and this in turn depends on education and other socio-economic factors.

6.3 The Cooperative Movement in Iraq

The cooperative movement in Iraq has had many forms, housing, consumers, credit, agriculture, etc., during the last four decades, but the main purpose here is to study the development of agricultural cooperatives. This will be considered for two periods; pre-and post-the Land Reform Law of 1958.

6.3.1 Agricultural Cooperatives before 1958

Historically, the cooperative movement began in Iraq with the promulgating of the Ottoman Cooperative Law of 1909. Under this a few cooperative societies were established, but none of them survived for long.[15] The modern cooperative movement started with the promulgation of the Cooperative Law No.27 of 1944. A Cooperative Department was established and first attached to the Ministry of Economics though later was transferred to the Ministry of Labour and Social Affairs.[16,17] This department was responsible for the promotion, registration, supervision and monitoring of cooperatives.

What made it necessary for the government to take steps to encourage the cooperative system in Iraq was the great need for organizing the efforts of the working class people, especially small farmers, in order to improve their socio-economic conditions. Furthermore, the government anticipated great possibilities for the future cooperative movement, especially in agricultural areas because the large majority of people were involved in agriculture. Cooperatives were expected to help to develop the agricultural sector more rapidly and efficiently through the pooling of all the available resources. Two main characteristics of the cooperative societies during this period were their voluntary, mostly single purpose nature and little or no government intervention.

According to available information, three cooperative societies had been registered before the passing of Cooperative Law No.27 of 1944. One of these, a credit cooperative, was registered in 1937 in the Zafaraniyian Agriculatural Project near Baghdad, although later abolished in 1944.[18,19] All three, however, failed mainly due to inadequate organization and poor administration, and they were all dissolved before the cooperative law of 1944 became effective. The first agricultural cooperative to be registered according to the Cooperative Law No.27 of 1944 in that year was in the Dujaila project.

Table 6.1 shows that by 1959 there were 43 cooperative societies, of which 21 were rural credit societies, the rest being multi-purpose agricultural cooperatives.[20,21] All these cooperatives were organized on the basis of unlimited joint liability of the members.[22] It appears from this table, however, that the cooperatives suffered from a lack of capital, e.g. the average capital per society and member was I.D. 110.2 and I.D. 2.38 respectively, hardly sufficient to provide adequate services for members. Apparently the Cooperative Department was also unable to give constructive, practical assistance in the organization and operation of cooperatives simply because of the lack of trained staff.[23] Thus, when the Ministry of Agrarian Reform began in 1960 to organize new farm cooperatives in areas under the land reform law, there were then only four active rural cooperatives in Iraq.[24]

Table 5.1 Registered Agricultural and Rural Credit Cooperatives By the End of 1959

Province	Agricultural			Rural Credit			Total		
	No. of Soc-ieties	No. of Memb-ers	Paid Cap-ital (I.D.)	No. of Soc-ieties	No. of Memb-ers	Paid Cap-ital (I.D.)	No. of Soc-ieties	No. of Memb-ers	Paid Cap-ital (I.D.)
Nineveh	2	30	109	5	108	248	7	138	357
Arbil									
Sulaimaniya	1	220	220				1	220	220
Kirkuk	1	16	46	7	240		8	256	46
Northern Region	4	266	375	12	348	248	16	614	623
Diala	9	571	2,378				9	571	2,378
Baghdad	4	91	202				4	91	202
Anbar				1	70	70	1	70	70
Kerbela									
Babil	2	270	510				2	270	510
Central Region	15	932	3,090	1	70	70	16	1,002	3,160
Al-Qadisiyia	2	210	500	1	10		3	220	500
Wasit	1	228	636	7	72	77	8	300	713
Maysan									
Thi-Qar									
Basrah									
Southern Region	3	438	1,136	8	82	77	11	520	1,213
Total	22	1,636	4,601	21	500	395	43	2,136	4,996

Source : Ministry of Planning : Annual Abstract of Statistics, 1957, 1958, 1959 Baghdad, Iraq.

6.3.2 Agricultural Cooperatives under Land Reform

The Land Reform Law No.30 of 1958 emphasized the development of agricultural cooperatives in Iraq, especially in areas under the land reform law (see pages 186). The government hoped that the cooperatives would fill the managerial gap caused by the departure of the owners of confiscated land (who hypothetically, and sometimes actually, provided a management function) in the supply of various production inputs and the supply of services necessary to maintain, for example, the irrigation and drainage system servicing the lands.[25,26] According to the Land Reform Law all land reform beneficiaries were obliged to join a cooperative society within their region.

With the implementation of land reform, several changes occurred in the Iraqi cooperative movement.[27] First, the Department of Cooperation of the Ministry of Labour and Social Affairs was upgraded to a General Directorate of Cooperation responsible for the registration and promotion of all form of cooperatives, as well as supervision and auditing. Secondly, came the establishment of the General Directorate of Cooperative System and Agricultural Production at the Ministry of Agrarian Reform, a department responsible for organization, improvement, development, promotion and supervision of all cooperatives in the land reform areas. Thirdly, with technical assistance from the F.A.O. a Cooperative and Extension Services Institute was opened in 1963. The objective of this institute is to train people to work as supervisors of local cooperatives. Finally, the Cooperative Law No.27 of 1944 itself was amended in 1959 to match new developments such as land reform.

The main characteristics of agricultural cooperatives have now become compulsory membership, multi-purpose functions, and operation under direct government supervision, all totally different to the pre-1958 situation.

Following the enactment of the Land Reform Law in 1958, the number of registered agricultural cooperatives gradually increased from 17 cooperatives in 1961 to 1,935 cooperatives by the end of 1978. Furthermore, the cooperative membership increased from 2,112 in 1961 to 331,973 in 1978. This increase was associated particularly with the continuing land distribution to the peasant farmers who compulsorily became members of agricultural cooperatives. Appendix D, Table D.1 shows the number of agricultural cooperatives registered annually between 1961 and 1975. Data on the number of active cooperatives, however, is not available and there is considerable doubt if all the registered agricultural cooperatives are in fact active.(28) In 1967 Ward estimated that there were 353 agricultural cooperatives registered during the first seven years of the 1958 land reform, but only half of these were active by the end of 1966.(29) There is little firm evidence to suggest that activity is any higher today. Fig. 6.1 shows that the biggest increase in the registration of agricultural cooperatives came in 1964, resulting from the 1964 amendment of the Land Reform Law to allow temporary government tenants to form agricultural cooperatives.(30)

In order to improve the activity of agricultural cooperatives, the Ministry of Agrarian Reform encouraged local primary cooperatives to join other agricultural cooperatives at the District level (Qadha). The resulting joint agricultural cooperatives also form among themselves a cooperative union or association at the provincial level (Mohafadha), the local unions at the provincial level also forming the General Union of Agricultural Cooperatives.(31,32) The first joint agricultural cooperative was established in 1968 and the number of joint cooperatives reached 245 in 1978.

The pattern of provincial distribution of agricultural cooperatives is significant because it reflects the activities of agricultural cooperatives and land reform in the provinces. Table 6.2 shows the provincial distribution of agricultural cooperatives and their members

FIG 6.1 AGRICULTURAL COOPERATIVES UNDER THE LAND REFORM, 1961-75

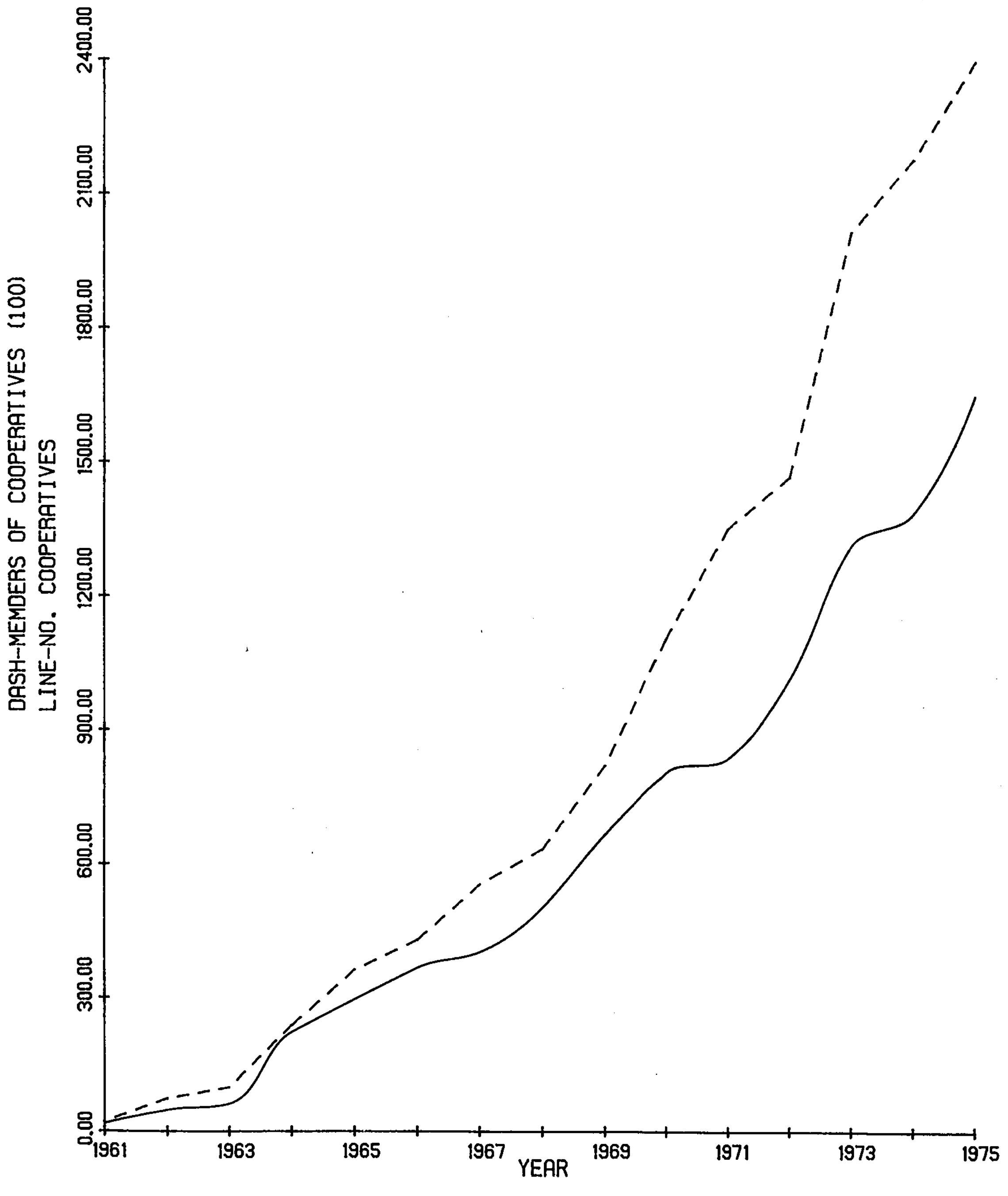


Table 6.2 Provincial Distribution of Agricultural Cooperation in 1975

Province	Joint Coop.	Area under its control (Donums)	Reserve Capital (I.D.)	Paid Capital (I.D.)	Members	No.of Coop.
Nineveh	21	4,205,407	85,978	121,887	32,918	266
Arbil	8	2,593,691	7,280	20,895	12,697	104
Sulaimaniya	12	1,638,336	16,857	28,414	12,302	135
Kirkuk	14	2,533,340	30,816	67,467	15,742	113
Northern Region	55	10,970,774	140,931	238,663	73,659	618
Diala	13	756,609	20,109	33,559	15,865	79
Baghdad	19	810,467	88,155	81,356	21,656	170
Anbar	9	206,871	16,238	30,017	5,342	77
Kerbela	5	144,012	20,752	32,717	6,878	45
Babil	10	867,678	36,517	55,135	21,260	124
Central Region	56	2,785,637	181,771	232,784	71,001	495
Wasit	13	1,435,984	71,879	66,496	28,801	156
Al-Qadisiya	16	743,825	30,399	45,010	17,821	158
Maysan	13	899,653	51,289	49,343	24,547	113
Thi-Qar	10	729,995	11,075	47,262	16,585	74
Basrah	8	528,434	8,131	19,989	7,230	38
Southern Region	60	4,337,891	172,773	228,100	94,984	539
Total	171	18,094,302	495,475	699,547	239,644	1,652

Source : Ministry of Planning :Annual Abstract of Statistics, 1975, Baghdad, Iraq, Table 3/40, p.104.

in 1975. It is clear from this table that Nineveh province had the largest share of the agricultural cooperatives, whilst Basrah and Kerbela had the smallest. This can be explained by the differences in areas of the agricultural land in the province (see Table 5.9) and of land reform implementation. Fig. 6.2 diagrammatically illustrates the same data.

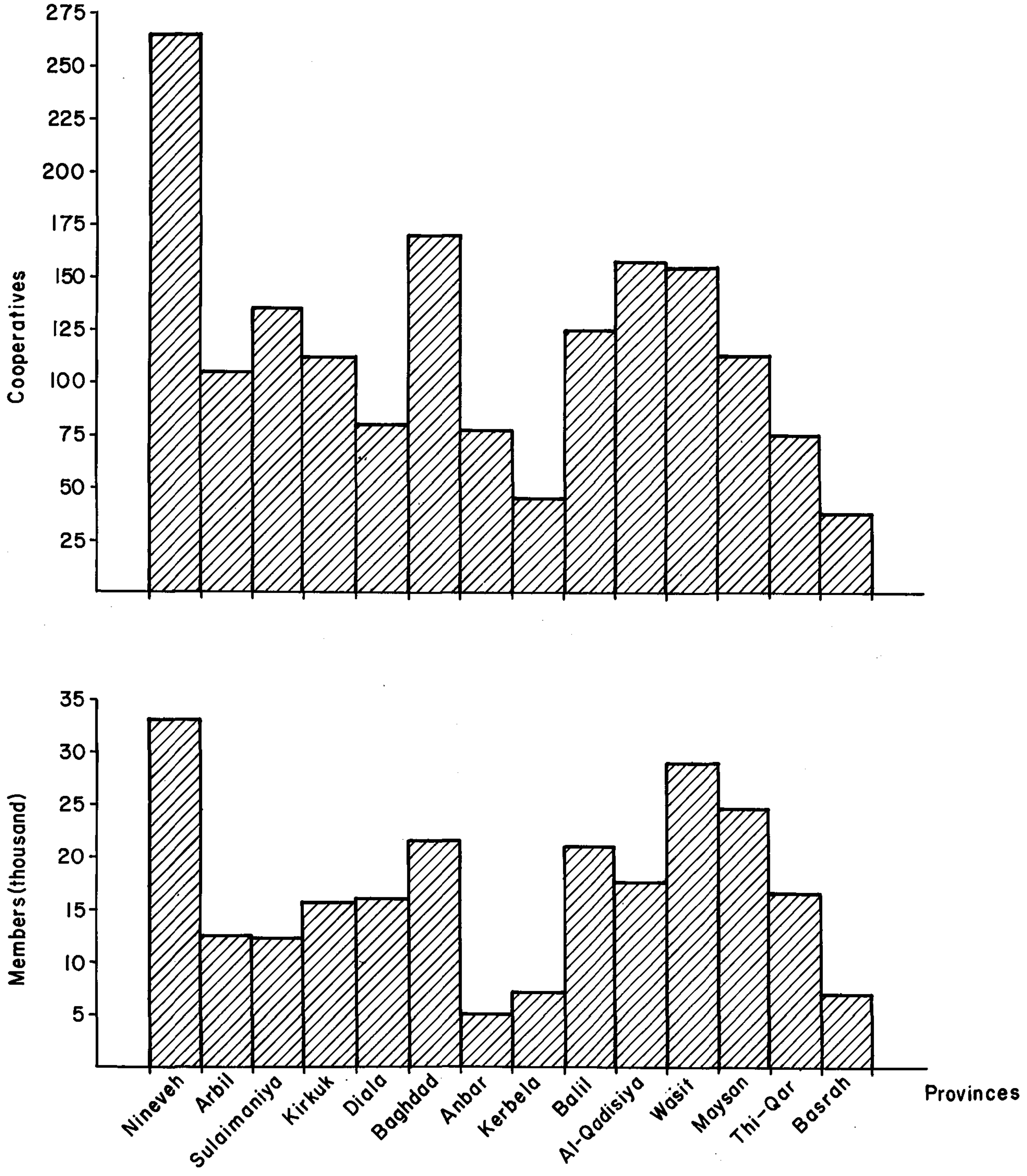
6.4 The State of Agricultural Cooperatives in The Land Reform Areas

It was noted in the previous section that agricultural cooperatives spread very rapidly between 1961 and 1978 in the land reform areas throughout the country. In this section an attempt will be made to study the coverage of agricultural cooperatives by examining the size of agricultural land under the agricultural cooperatives' control, and the size of cooperatives' membership.

6.4.1 Agricultural Land under the Agricultural Cooperatives' Control

Table 6.3 shows that the total agricultural land controlled by agricultural cooperatives was recorded as 21.9 million donums in 1976. It seems, however, that this was an over-estimation. This conclusion is reached by a consideration of three other sets of data. First, the average size of holdings in cooperatives, according to Table 6.3, is 74.0 donums, considerably higher than the average size of the land reform holdings mentioned in the previous chapter (see page 191). Secondly, the total of land expropriated (on which cooperatives were especially encouraged) was almost 11.0 million donums in 1977, a figure barely over 50 per cent of that claimed to be controlled by cooperatives. Thirdly, the total distributed land on both an owned and leased basis was about 12.1 million donums for the same period, again far less than the cooperative controlled area claimed in Table 6.3 (see also page 191 and Table 5.10). This latter total is in fact very close to the utilized land reported in 1971 (see Table 4.2), suggesting that cooperatives control most of the agricultural land, and this, as we shall see, is

Fig. 6·2 THE PROVINCIAL DISTRIBUTION OF AGRICULTURAL COOPERATIVES AND ITS MEMBERS IN 1975



certainly not the case. Generally speaking, the total area under the agricultural cooperatives control cannot be expected to grossly exceed the total area of land distributed to or held by land reform beneficiaries.

6.4.2 The Size of Cooperative Membership

Considering the number of land reform beneficiaries (owners and government tenants) who joined agricultural cooperatives, we see from Table 6.3 that nearly 290 thousand farmers joined agricultural cooperatives by the end of 1976. It seems, therefore, that the total number of land reform beneficiaries who joined agricultural cooperatives is less than the total number of land reform beneficiaries, some 338,897 (owners and government tenants) in 1976. Since this indicates that only 87.5 per cent of the total land reform beneficiaries joined agricultural cooperatives, it also raises further doubts concerning the agricultural area claimed to be under the agricultural cooperatives control (see Section 6.4.1).

It is clear from this brief examination that on the one hand the total reported agricultural area under the cooperatives' control was overestimated, whilst on the other hand, it appears that only 87.5 per cent of the land reform beneficiaries joined agricultural cooperatives in 1976.

It is very difficult, therefore, to reach firm conclusions either on the area covered by agricultural cooperatives, and even the effectiveness of requiring land reform beneficiaries to be members of agricultural cooperatives. The published data, however, are all that are available for analytical purposes.

6.5 The Activities of Agricultural Cooperatives

The success of agricultural cooperatives depends on their ability to fulfil the managerial gap left after the removal of landlords. The ability to provide adequate services, such as supplying seeds, fertilizers, credit

Table 6.3 Progress of Agricultural Cooperative

Year	No. of Coop	Members	Paid Capital (I.D.)	Reserved Capital (I.D.)	Area (Donums)
1961	17	2,306	2,078	494	179,000
1962	50	8,397	3,217	2,034	461,000
1963	65	11,404	7,312	3,102	709,000
1964	225	29,496	28,699	7,778	1,978,000
1965	298	39,244	56,377	16,612	2,387,000
1966	367	47,725	76,167	26,919	2,563,000
1967	410	54,750	100,746	41,999	2,829,000
1968	473	62,976	111,296	59,155	3,297,000
1969	608	76,171	145,925	73,604	3,612,000
1970	786	107,797	213,880	87,098	5,181,000
1971	831	126,968	267,581	154,899	6,766,000
1972	992	146,630	326,422	244,337	9,955,000
1973	1,275	201,243	490,243	330,880	13,454,000
1974	1,386	217,723	589,563	413,908	13,641,026
1975	1,652	239,644	700,547	495,472	18,094,302
1976	1,852	296,502	1,101,000	787,000	21,938,848

Source : Ministry of Planning: Annual Statistical Abstract, 1972, 1973, 1974, 1975 and 1976, Baghdad, Iraq.

and farm machinery as well as other services, for example marketing and storage facilities, depends in turn on the financial resources available for cooperatives.[33] The lack of direct information on these services, the varied stories of success and failure of individual cooperatives, as well as other socio-economic and political factors, all raise many difficulties in any evaluation of the progress of cooperatives in general in Iraq. We have therefore to approach evaluation indirectly by attempting to examine the impact of agricultural cooperatives on agricultural productivity and production and farmers' incomes. It is realised that such an analysis requires major field investigation on agricultural productivity and farmers' incomes, both in the cooperative controlled area and outside (non-land reform areas). Here, in the absence of any such large-scale studies, we have to rely on the availability of financial resources used as an indicator of the size and coverage of these services in the land reform areas.

In general, the financial resources of agricultural cooperatives depend on two major sources of capital: owned capital and government credit or loans. The owned capital, however, can be split into paid-up and reserve capital. Current values are used throughout.

6.5.1 Owned Capital

Considering first the paid-up capital, Table 6.3 shows the total increased from I.D. 2,078 in 1961 to I.D. 1.1 million in 1976, i.e. the average paid-up capital per agricultural cooperative increased from I.D. 122.2 in 1961 to I.D. 594.5 in 1976 or by an increase of nearly five fold (see Table 6.6). This increase in paid capital could, of course, result from the increasing size of membership, or an increase in the share value. It is obvious from Table 6.3 that the membership of agricultural cooperatives increased from 2,306 members in 1961 to 296,502 members in 1976. As for the share value or the average capital paid up by farmers,

Table 6.6 shows that this increased from I.D. 0.90 in 1961 to I.D. 3.71 in 1976. It is obvious that the increase in paid capital resulted both from growing membership and the average paid capital per farmer.

6.5.2 Government Credits or Loans

The second source of working capital available to agricultural cooperatives is government loans. Table 6.4 shows the amount of loans made by the Agricultural Bank to agricultural cooperatives between 1964/65 and 1976/77. Usually, the General Directorate of the Cooperative System and Agricultural Production draws up in advance a plan of credit requirements by agricultural cooperatives classified by the purposes of the credit and sends this to the Agricultural Bank.(35) The fulfilment of the plan depends on the financial capability of the Agricultural Bank itself, as measured, for example, by deposits, repaid loans and capital available. The interest rate is 3 per cent below the standard interest rate in the country.(36)

The total loans made to agricultural cooperatives increased from I.D. 52,364 in 1964/65 to nearly I.D. 9.3 million in 1976/77 as shown in Table 6.4. The distribution of these loans, classed according to agricultural purposes, and shown in Table 6.5, shows that nearly 44.7 per cent (average of 13 years) went to agricultural supplies, i.e. mainly seeds, and 25.9 per cent went to farm machinery. Nearly 30 per cent of loans went to other agricultural services, i.e. marketing, animal production and others. This analysis shows that agricultural cooperatives were, above all, supply centres for basic agricultural inputs such as seeds.

The rate of increase in government loans to cooperatives is analysed on three bases : the number of cooperatives; number of members; the area under cooperative control. The amount of government loan per agricultural cooperative increased from I.D. 175.7 in 1964/65 to I.D. 4,749.6 in 1975/76 (see Table 6.6), apparently a very substantial increase. This increase was the result, first, of the increase in governmental income after the oil price increases and state income in 1973/74. Secondly, the government was even more committed to promote agricultural production through cooperatives following the unsuccessful previous attempts to increase agricultural production. The government paid loan per cooperative member increased considerably from I.D. 1.33 in 1964/65 to I.D. 29.7 in 1975/76 (Table 6.6).

Government loans per donum (utilising the suspect but only figures available) increased from I.D. 0.022 in 1964/65 to I.D. 0.40 in 1975/76. Here the question which arises in each case is whether the rate of increase in paid capital was enough to match the increasing production costs and agricultural area under cooperatives' control, let alone be sufficient in absolute terms.

Considering the increased working capital per donum first, Table 6.6 shows that the average working capital per donum was I.D. 0.046 (paid-up capital + government loans) in 1964/65, increasing to I.D. 0.451 per donum in 1975/76. The average working capital available, through cooperatives, to a farmer with an average holding of 74 donums (this average according to Table 6.3) increased from I.D. 3.4 in 1964/65 to I.D. 33.37 in 1975/76. Although these values are very low for the encouragement of the growth of farming on a commercial basis, there are three qualifying points which must be kept in mind. First, the total area under cooperatives, as we have seen, is overestimated (see page 215). Secondly, a distinction must be made between the working capital available to farmers in the rainfed and irrigated areas (see below). Thirdly, the total area under cooperatives' control is not usually under cultivation at any one time due to the dominance of the fallow system in the country, apart from the date gardens, i.e. the working capital should be calculated on the basis of the annually cropped area, and not on the gross farm area. Bearing in mind these points, one can be sure that the working capital per donum is higher than shown in Table 6.6 although the degree to which this may be significant cannot

Table 6.4 Loans Made by the Agricultural Bank to Agricultural Cooperatives (I.D.)

Years	Agricultural Supply	Agricultural Machinery	Coop. Marketing	Animal Health	Agricultural services	Other purposes	Total
1964/65	18,322	34,042	-	-	-	-	52,364
1965/66	42,353	48,210	6,125	-	-	-	96,688
1966/67	85,970	16,325	10,822	7,002	-	5,000	125,119
1967/68	194,750	4,300	60,975	2,000	-	750	262,775
1968/69	170,801	18,125	115,730	85,272	21,622	1,115	412,665
1969/70	1,138,955	151,389	354,462	222,459	125,731	33,526	2,026,522
1970/71	990,629	168,771	336,772	113,526	96,285	30,355	1,736,338
1971/72	832,717	517,425	349,464	299,656	153,439	46,151	2,198,852
1972/73	1,055,853	617,066	316,478	492,419	129,349	173,755	2,784,422
1973/74	1,141,618	670,521	118,774	717,696	85,843	170,904	2,905,356
1974/75	1,586,428	3,076,337	135,966	921,749	32,026	167,777	5,920,283
1975/76	2,004,792	3,446,707	354,013	2,513,678	178,186	298,876	8,796,252
1976/77	3,758,516	2,345,132	398,840	2,094,132	-	698,175	9,294,795

Source : Ministry of Planning, Annual Abstract of Statistics, 1975, Table 3/43 p.107 and 1977, Table 3/46 p.117, Baghdad, Iraq.

Table 6.5 Distribution of Government Loans According to the Kind of Services

Years	Agricultural Supplies	Agricultural Machinery	Coop. Marketing	Animal Wealth	Agricultural services	Other Services	Total
1964/65	35.0	65.0	-	-	-	-	100
1965/66	43.8	49.9	6.3	-	-	-	100
1966/67	68.7	13.1	8.6	5.6	-	4.0	100
1967/68	74.1	1.6	23.2	0.8	-	0.3	100
1968/69	41.1	4.4	28.0	20.7	5.2	0.3	100
1969/70	56.2	7.5	17.5	11.0	6.2	1.6	100
1970/71	57.0	9.7	19.4	6.5	5.6	1.8	100
1971/72	37.9	23.5	15.9	13.6	7.0	2.1	100
1972/73	37.9	22.2	11.4	17.7	4.6	6.2	100
1973/74	39.3	23.1	4.1	24.7	2.9	5.9	100
1974/75	26.8	52.0	2.3	15.6	0.5	2.8	100
1975/76	22.8	39.2	4.0	28.6	2.0	3.4	100
1976/77	40.5	25.2	4.3	22.5	-	7.5	100
Average	44.7	25.9	12.1	15.2	4.3	3.3	

Source : Calculated from Table 6.4

Table 6.6 Average Working Capital Available Annually Per Cooperative, Member and Donum

I.D.

Years	Paid-up Capital			Paid-up Government Loan			Total Working Capital		
	Per Member	Per Coop.	Per Donum	Per Member	Per Coop.	Per Donum	Per Member	Per Coop.	Per Donum
1960/61	0.90	122.2	0.012						
1961/62	0.38	64.3	0.007						
1962/63	0.64	112.5	0.010						
1963/64	0.97	127.6	0.015						
1964/65	1.44	189.2	0.024	1.33	175.7	0.022	2.77	364.9	0.046
1965/66	1.60	207.5	0.030	2.03	263.5	0.038	3.63	471.0	0.068
1966/67	1.84	245.7	0.036	2.29	305.2	0.044	4.13	550.9	0.080
1967/68	1.77	235.3	0.034	4.17	555.5	0.080	5.94	790.8	0.114
1968/69	1.92	240.0	0.040	5.42	678.7	0.114	7.34	918.7	0.154
1969/70	1.98	272.1	0.041	18.80	2,758.3	0.391	20.78	3,030.4	0.432
1970/71	2.11	322.0	0.040	13.68	2,089.5	0.257	15.79	2,411.5	0.297
1971/72	2.23	329.1	0.033	15.00	2,216.6	0.221	17.23	2,545.7	0.254
1972/73	2.43	384.5	0.036	13.82	2,183.9	0.207	16.25	2,568.4	0.243
1973/74	2.71	425.4	0.043	13.34	2,096.2	0.213	16.05	2,521.6	0.256
1974/75	2.92	424.1	0.039	24.70	3,583.7	0.327	27.62	4,007.8	0.366
1975/76	3.71	594.5	0.050	29.70	4,749.6	0.401	33.41	5,344.1	0.451

Sources : Calculated from Tables 6.3 & 6.5.

be established because of the lack of statistical data.

Similar problems arise when we examine production costs, both current and capital. Current costs cover wages, fertilizers, seeds, rent,fuel and relevant interest charges. Capital costs include farm machinery, building and relevant interest charges. Generally, the majority of farmers in developing countries, as in Iraq, have insufficient invested and working capital and poor scientific farming knowledge, these leading to low productivity and low incomes. Improving agricultural productivity and production always requires some extra working capital, and, in developing countries, farmers have to rely on credit to break through the vicious circle of low productivity - low investment, the credit being supplied by the government and/or the private sector. The main concern here is to find out whether credit availability through the government to agricultural cooperatives is sufficient to increase productive investment.

In the case of Iraq, up-to-date information is not available on production costs, and the only official data available on a national basis is for the 1970/71 season. Table 6.7 shows the production costs of the major agricultural crops in Iraq in 1970/71 and this reveals the following main points. First, costs of HYV production are higher than for traditional varieties. This means that extra working capital per farmer and per donum was and is required to encourage farmers to use HYV's. Secondly, the production cost of irrigated area crops such as rice and cotton was much higher than for the rainfed area's wheat and barley.

A study was carried out by the Ministry of Planning in 1971/72 investigating credit availability in Wasit, Thi- Qar and Kirkuk provinces. This suggested that the average production cost per donum of major field crops was I.D. 2.02. (36) The first two provinces lie in the irrigated area, whilst the last is in the rainfed area. The average production cost used in this study is of the same order as the production cost of wheat and

Table 6.7 Production Cost Per Donum of Major Crops in 1970/71

Crops	Irrigated		Rainfed
	Improved Varieties I.D.	Local Varieties I.D.	I.D.
Wheat	8.43	5.24	2.81
Barley		4.66	2.56
Rice		15.84	
Cotton		13.88	
Maize		11.70	
Sesame		7.00	

Source : Ministry of Agricultural & Agrarian Reform (1974) : Study on Production Costs and Returns per Donum of Major Field Crops in Iraq for the 1970/71 Season, Baghdad, Iraq, (in Arabic) barley in the rainfed area in the 1970/71 season (see Table 6.7). The reason for this similarity is that 50 per cent of the reported area in the 1971/72 study was under wheat and barley in the rainfed area.(37)

The figures given in Table 6.7 and the Ministry of Planning study indicate that the costs of production per donum for both the 1970/71 and 1971/72 seasons were higher than the working capital available per donum in 1975/76 even if we adjust the latter figures to meet the qualifications made above on page 221. Although government credit increased substantially in magnitude, in reality neither the amounts available per farmer or per donum nor the rate of increase were sufficient to improve production. We also have to consider the increases in production costs as a result of domestic and imported inflation and real increases in input costs, despite the government subsidising of inputs factors from 1970 onwards (see page 85).(38,39)

Furthermore, the study which was carried out by the Ministry of Planning suggested that 71.1 per cent of the available credit to farmers in cash and kind was in fact from the private sector as shown in Table 6.8. This is proof of the considerable actual demand by farmers for credit. Bearing in mind the increase in demand for working capital between 1971/72 and 1975/76 as a result of the expansion of the area under cooperative control and increases in production cost, it seems that the increase in government supplied credit from I.D. 0.022 per donum in 1964/65 to I.D. 0.401 per donum in 1975/76 was certainly not enough to enable agricultural cooperatives to provide adequate services to their members, who therefore had to turn to the private sector. Other data also suggest a continued shortage of government credit. For example, agricultural cooperatives owned only 280 tractors in 1976 to plough (nominally) 22 million donums under their control, i.e. the ratio is one tractor to 78,353 donums (19,588 hectares), and even if one halved this area, there would have been no way of providing

Table 6.8 Source of Supplied Credit (Cash and Kind) in 1971/72

Agency	Supplied Credit I.D.	%
Cooperatives	850	4.5
Agricultural Bank	473	2.5
Directorate of Extension	3,636	19.3
Private Traders	6,896	36.7
Friends and Relatives	6,473	34.4
Others	480	2.6
Total	18,808	100

Source : Singh, G.D. (1974) : Study of Agricultural Credit Situation in Three Muhafadhas, Ministry of Planning, Baghdad, Iraq, Table 6, p.17.

adequate tractor services at the right time even if all the tractors were in working condition.

Generally speaking, the Iraqi government needs to increase still further credit facilities to agricultural cooperatives to enable them to buy their capital inputs. This increase would have to be very substantial in magnitude to give the agricultural sector a significant lift if only because of the development of the irrigation system and the encouragement of the cultivation of HYV's.

These and virtually all the technical measures for increasing productivity and production mean that the demand for farm machinery and other input factors will increase. Experience in India shows that there is a close correlation between introducing HYV's and the need for credit facilities.(40) Moreover, increasing credit facilities must be associated with good supporting policies, such as extension services, pricing, marketing and transporting facilities, otherwise the expected results from e.g. irrigation and drainage projects, will not be as hoped for.(41)

6.6 <u>The Impact of Agricultural Cooperatives on Agriculture</u>

It has been noted that the main general objective of agricultural cooperatives is primarily to solve the socio-economic problems of their members. Solving economic agricultural problems, however, can be achieved by minimizing production costs, increasing agricultural productivity or by both measures. Achieving such progress has two main requirements. Firstly, supplying input factors through cooperatives at reasonable cost and secondly, organizing the farming system in such a way as to minimize costs, e.g. developing a common rotation system and land consolidation. If these improvements are not successfully achieved, there is considerable doubt whether agricultural cooperatives will have a significant impact on the performance of the agricultural sector as a whole.

In the previous section, 6.6, we saw that agricultural cooperatives were apparently unable to provide adequate services because of a shortage of finance. Although there is a paucity of detailed data on agricultural productivity in the cooperative areas we can use more general data on agricultural productivity of certain crops as an indicator of the success of cooperatives in improving agricultural productivity per unit. Average yields per donum of principal crops have been calculated for the periods before and after the land reform, i.e. before and after the expansion of agricultural cooperatives in the country. Table 6.9 shows that the average yield per donum of wheat, barley and rice, for the country as a whole as well as for the regions, before and after the expansion of agricultural cooperatives in association with the 1958/59 land reform. It is clear from this table that the average yield per donum of barley declined after 1958, average wheat yield per donum did not significantly increase, whilst average rice yield per donum increased by 27.8 per cent. The main reason for increasing rice yield per donum is related to the use of fertilizers in rice production in recent years. Furthermore, as already indicated in Chapter 5, agricultural production of other crops also declined for a period after the implementation of the Land Reform Law of 1958 (see page 193). These data, summarily presented in Table 6.9 are for the whole country, and cooperatives' performance cannot be isolated. However, a study of three agricultural coops. in Baghdad province adjudged successful by the Higher Agricultural Council in 1975/76 disclosed that these areas under agricultural cooperatives remained affected by salinization, lack of adequate irrigation and drainage facilities, and both in these respects and in yields, did not significantly differ from the national average.(42)

Probably the only positive impact of cooperatives on farmers was to increase their incomes. This increase could be related in part to government subsidising of input factors which cooperative members enjoy

Table 6.9 Changes in Productivity of Wheat, Barley and Rice

(Kgs. per Donum)

	Wheat			Barley			Rice		
	Average pre-1958	Average post 1958	Difference %	Average pre-1958	Average post 1958	Difference %	Average pre-1958	Average post 1958	Difference %
North	127.7	133.4	4.5	205.9	173.7	-15.6	587.7	566.4	- 3.6
Central	167.4	175.8	5.0	216.7	206.0	- 4.9	304.7	457.2	+50.1
South	180.0	194.5	8.1	244.9	199.6	-18.5	379.5	491.2	+29.4
Country	145.5	150.1	3.2	220.7	192.5	-12.8	380.5	486.2	27.8

Sources : calculated from Appendix H, Tables H.5 and H.6.

more than do individual farmers (see page 85). Secondly, controlled marketing of agricultural products reduced the marginal profit of the middlemen, and raised returns to farmers. Thirdly, there was an increase of non-agricultural farmers' income. The H.A.C. study mentioned above confirmed such factors affecting the increase in farmers' incomes, but does not make possible any comparison of incomes inside and outside the cooperative sector.[43]

We can summarize the discussion so far as follows. Agricultural cooperatives spread very rapidly in the country after the introduction of the Land Reform Law of 1958. Nonetheless, the impact of these cooperatives on agriculture as a whole was not very significant because of two groups of factors. The first is associated with the cooperatives themselves, i.e. capital availability, organization, education, loyalty,etc., and all these problems have been well covered by many authors.[44,45,46,47] The second group of factors affect agriculture as a whole, i.e. soil salinity, inadequate irrigation and drainage facilities, ineffective extension services,etc.

6.7 State and Collective Farms

Parallel to the development of the agricultural cooperatives, the government tried to develop other forms of farming systems in Iraq, i.e. state and collective farms. The main objectives of these farms were political and economic. Politically, the government policy attempted a gradual socialization of agriculture.[48] The economic objectives aimed at establishing commercial farms based on new large scale farming technology to provide ideal examples for surrounding areas. In this section we will examine the progress of these farms and their impact on agricultural production and productivity as a whole.

6.7.1 State Farms

State farms exist in most countries either as commercial production units as in U.S.S.R. and East European countries, or for experimental purposes as in most other European countries.

The first state farm was established in 1921 at Rustamiya, later called Zafaraniya, near Baghdad. [49] In 1933, Bakarajo farm was established in the north and, later, Abu-Graib near Baghdad was established in 1937. [50] The main objectives of these state farms was experimental, i.e. testing new HYV's, new crops and developing new farming systems.

The idea of state farms received more support after 1958. The first state commercial farm was established at Latifiya near Baghdad. According to the 1959 Soviet-Iraqi agreement, five further state farms were to be built, three financed by the Soviet Union. [51,52] In addition to the commercial objectives, these state farms were supposed to be examples in terms of using new agricultural inputs and technology. They could also be used as extension farm bases for the local farmers.

The productive efficiency of state farms is our main concern in this study. Efficiency can be measured in this case in two different ways, first, through the cost of production and secondly, productivity per donum. A study of three state farms (Al-Sawarah, Al-Shatra and Al-Latifiya) in 1971 revealed that the costs of production in these state farms were higher than the national average for the same period. [53] Tables 6.10, 6.11 and 6.12 show production cost for selected crops in these state farms. Such high costs meant that most of such state farms were working at losses as is shown in Tables 6.13, 6.14 and 6.15. The main reason for such high costs per donum were related to overemployment, i.e. 60 per cent of the total cost went to labour wages, management expenditure and wastage. [54,55]

Considering agricultural productivity in the state farms, Tables 6.16, 6.17, 6.18 reveal two major points. First, the average production yields of these crops do not significantly differ from the national averages. We see that the average yield per donum fluctuated annually when it should have been more stable than the national average given the new input technology available to control production factors on the state farms. Secondly, even when the yields per donum in the state farms were higher, these increases did not justify the increase in production costs of these crops. In reality, the cost of production per unit of new agricultural technology is necessarily high, but agricultural productivity per unit should be higher to justify such increasing cost. In the quoted cases this did not occur.

In addition to over-employment, the poor economic performance of the state farms can be related to the common agricultural problems in Iraq, i.e. soil salinization and absence of irrigation and drainage facilities.[56,57] This also implies that technical and managerial skills on state farms was not of sufficiently higher capability in dealing with these problems.

The Ministry of Agricultural and Agrarian Reform is also responsible for another category of farming organization, i.e. State Agricultural Projects, the management of which is controlled by the government. In this case all the essential services are supplied by the government in the form of permanent extension workers, and technicians specialized in irrigation, drainage, farm machinery, soils and farming systems; in addition, in each such project a state farm is established to serve as a demonstration, trials and extension centre. These projects were designed essentially to supervise land reform beneficiaries. Table 6.19 shows there were 17 agricultural projects in 1975. However, data on the impact of these projects on agriculture are contradictory and not available in detail. A study in 1970 by M.M.A.Ahmed, et al. for example, reveals that Al-Wahda project faces many problems, i.e. low productivity, salinization and water shortage.[58]

Table 6.10 The Cost of Production in Al-Swarah State Farm and the National Average

I.D.per Donum

Year	Wheat		Barley		Cotton	
	Swarah Farm	Iraqi National Level	Swarah Farm	Iraqi National Level	Swarah Farm	Iraqi National Level
1965	10.201	5.470	8.573	4.685	29.019	16.865
66	12.781	5.735	11.266	4.988	36.963	17.812
67	12.720	6.242	10.930	5.334	44.831	19.218
68	12.601	6.547	*	5.596	35.289	20.000

* no data available

Source : Al-Bander & Naji, A.(1971) : The Reality of State Farms in Iraq, Ministry of Planning, Baghdad, Iraq, Table 16, p.52 (in Arabic)

Table 6.11 The Cost of Production in Al-Shatra State Farm and the National Average

I.D. per Donum

Year	Wheat		Barley		Rice	
	Al-Shatra Farm	National Level	Al-Shatra Farm	National Level	Al-Shatra Farm	National Level
1963	17.966	5.230	13.187	4.280	22.339	7.950
1964	20.101	5.310	14.932	4.216	26.866	8.110
1965	18.653	5.470	13.036	4.685	23.730	8.400

Source : As in Table 6.10, Table 30, p.83.

Table 6.12 The Cost of Production in Al-Latifiya State Farm and the National Average

I.D. per Donum

Year	Wheat		Cotton	
	Latyfia Farm	National Level	Latifiya Farm	National Level
1963	22.423	5.230	52.874	*
1964	12.557	5.310	35.438	*
1965	7.486	5.470	22.894	16.865
1966	5.750	5.735	16.389	17.812

Source : As in Table 10, Table 38, p.93.

Table 6.13 Cost and Return Per Donum in Al-Swarah State Farm

Year	Wheat			Barley			Cotton		
	Cost of production	Return	net profit or loss	Cost of production	Return	net profit or loss	Cost of production	Return	net profit or loss
1965	10.201	4.672	-6.184	8.573	3.386	-5.186	29.019	11.115	-17.904
66	12.781	13.040	.259	11.266	4.437	-6.829	36.963	12.445	-24.518
67	12.720	*	*	10.930	*	*	44.831	16.620	-28.211
68	12.601	17.875	5.274	*	*	*	35.289	17.940	-17.349

* No data available

Source : As in Table 6.10, Table 14, p.48.

Table 6.14 Cost and Return Per Donum in Al-Shatra State Farm

Year	Wheat			Barley			Rice		
	Cost of production	Return	net profit or loss	Cost of production	Return	net profit or loss	Cost of production	Return	net profit or loss
1963	17.966	3.939	-14.765	13.087	3.564	-9.523	22.339	13.715	- 8.624
64	20.111	4.346	-15.765	14.932	4.460	-10.472	26.866	*	*
65	18.653	5.808	-12.845	13.036	5.540	-7.496	23.736	15.106	- 8.630

* No data available

Source : As in Table 6.10, Table 28,p.81.

Table 6.15 Cost and Return Per Donum in Al-Latifiya State Farm

Year	Wheat			Cotton		
	Cost of Production	Return	Net profit or loss	Cost of Production	Return	Net profit or loss
1963	22.423	12.920	-9.503	52.874	21.210	-31.564
64	12.557	12.810	0.253	35.438	23.625	-11.813
65	7.486	11.070	3.584	22.894	13.800	- 9.094
66	5.750	16.200	5.450	16.389	15.375	- 1.014

Source : As in Table 6.10, Table 37, p.91.

Table 6.16 Average Yield of Some Crops in Al-Swarah State Farm, Wasit Province and Iraq.
(kilograms/donum)

Year	Wheat			Barley			Cotton		
	Al-Swarah	Wasit Prov.	Iraq	Al-Swarah	Wasit Prov.	Iraq	Al-Swarah	Wasit Prov.	Iraq
1964	180	166	148	*	192	184	137	192	184
65	142	179	119	157	200	178	171	248	234
66	329	182	118	204	201	198	161	393	217
67	*	186	169	223	187	191	277	198	222
68	325	164	142	*	164	257	299	142	222

* no data available

Source : As in Table 6.10.

Table 6.17 Average Yield of Some Crops in Al-Shatra State Farms, Thi -Qar Province and Iraq
(kilograms/donum)

Year	Wheat			Barley			Rice		
	Al-Shatra	Thi-Qar Province	Iraq	Al-Shatra	Thi-Qar Prov. ince	Iraq	Al-Shatra	Thi-Qar Province	Iraq
1961	*	180	171	315	233	194	171	302	268
62	155	179	128	198	137	142	211	466	326
63	101	153	124	223	185	184	126	458	391
64	106	163	148	277	190	178	*	388	421

* no data available

Source : As in Table 6.10

Table 6.18 Average Yield of Some Crops in Al-Latifiya State Farm, Baghdad Province and Iraq
(kilograms/donum)

Year	Wheat			Barley			Cotton		
	Al-Latifya	Baghdad Prov.	Iraq	Al-Latifya	Baghdad Prov.	Iraq	Al-Latifya	Baghdad Prov.	Iraq
1961	218	170	171	374	200	194	225	138	*
62	199	128	128	288	194	142	98	187	*
63	323	176	124	562	164	184	303	165	*
64	305	148	148	*	184	184	315	184	184
65	246	175	119	439	190	178	184	130	234
66	360	168	118	528	198	198	205	237	217
67	*	199	169	*	204	191	246	219	222
68	177	142	142	350	257	257	230	222	222
69	513	168	*	600	218	*	231	241	*

* no data available

Source : As in Table (6.10)

Table 6.19 State Agricultural Projects as of 31/12/1975

Name of the Project	Area (Donums)	State farm Area	No. of coop.	Total Member of the coop.	Total area of the region of coop. works	No. of Joint Coop.	No. of collective Farms	Members of collective Farms	Total area of region of the collective farm
7th April	87,352	26,000	7	1,097	56,110	1	1	117	4,800
Al-Wihda	88,866	20,157	10	2,493	63,209	2	-	-	-
30th July	161,539	10,000	5	2,184	57,299	1	5	1,679	63,980
17th July	99,000	-	2	633	47,890	1	3	853	49,510
Al-Shihamiya	153,800	42,500	1	350	30,000	1	5	1,509	110,300
Al-Muthanna	120,000	52,987	9	1,093	82,328	1	-	-	-
Delmej	64,127	23,740	2	157	21,800	1	4	432	31,580
Abo-Bshoot	31,132	14,598	3	482	16,500	1	-	-	-
Eski-Kaluk	51,999	-	5	1,061	51,230	1	1	22	365
Dijaila	590,000	27,900	10	1,226	128,630	1	-	-	-
14th Ramadhan	14,747	1,190	2	245	11,228	1	1	53	1,809
Al-Dor	12,000	400	1	66	11,520	-	-	-	-
Al-Latifyia	25,000	1,800	2	298	22,750	1	-	-	-
Al-Hawija	417,729	1,726	11	2,404	401,009	1	-	-	-
Shahrazoor Farm	40,800	3,000	5	907	40,332	1	-	-	-
Al-Shatra Farm	17,000	16,700	-	-	-	-	-	-	-
Al-Hamza Farm	30,000	30,000	-	-	-	-	-	-	-

Source : The Statistical Abstract of 1975, Ministry of Planning, Baghdad, Iraq.

6.7.2 Collective Farms

The idea of collective farms came out of the 1968 revolution and trends in the number of collective farms, their members and the area under their control are shown in Table 6.20. Their purpose can be seen as similar to that of the state farms (p.232). Similar also is the lack of detailed information on the impact of these farms on agricultural production. However, the decrease in membership from 10.543 members in 1974/75 to 8,540 in 1976/77 may suggest that these farms also face some problems.

Generally speaking, it seems that government intervention in agriculture through the establishment of state farms, agricultural projects and collective farms was not very successful in developing agriculture to the level at which the government was aiming. For example, with high production costs and low agricultural productivity their performance is on balance no higher than that of individual farmers. This suggests that these projects and production units faced both organization and managerial problems on the one hand, and technical and environmental problems on the other. Against this background, the government, according to many unpublished reports, has changed its attitude recently towards such projects.

6.8 Farm Management and Decisions

It appears from Chapter 5 and earlier sections of this chapter that farm management and decision making in Iraq falls into two categories : first, that of the government and other socialized farms, and secondly, that by individual farmers inside and outside the agrarian reform area. In this section, the distribution of area and number of holdings will be considered according to each category to weight their impact on farm management.

Table 6.21 shows the distribution of holdings and the area under their control according to the form of management. It is clear from this table that the most significant category in farm operation remains that

Table 6.20 Progress of the Collective Farms in Iraq

Year	Number of collective farms	Number of Members	Area under the collective farm(don.)	Average number of farmer in farm	Average area per farm (don.)	Average area per farmer (don.)
1971/72	6	490	24,160	81.7	4,026.7	49.3
72/73	35	3,601	234,427	102.9	6,697.9	65.1
73/74	72	11,253	534,920	156.3	7,429.4	47.5
74/75	78	10,543	576,392	135.2	7,389.6	54.7
75/76	79	9,857	634.099	124.8	8,026.6	64.3
76/77	79	8,540	723,405	108.1	9,157.0	84.3

Source : Ministry of Planning, Annual Abstract of Statistics, 1977, Baghdad, Iraq, Table 3/23, p.73.

of individual landholders, including all types of owner-operators and government and private tenants. This category covers 95.8 and 88.5 per cent respectively of holdings and agricultural land area as reported in the 1971 agricultural census.

The significance of this category is clearly very important for the planned future development of agriculture. Considering, for example, the number of farmers in this category in relation to the number of farmers who joined agricultural cooperatives in 1976, we see that only 52 per cent of individual farmers inside and outside the agrarian land reform programme had joined agricultural cooperatives by 1976 (see Table 6.3). This indicates the number of agricultural cooperatives required in the future if all farmers in this category are eventually to be included. It also indicates the scale of provision necessary, including credit and supervision, if the government is to continue to regard the cooperative movement as central to successful agricultural development. After all, the government has committed itself to provide these services through many government departments and institutions and failure to fulfil these commitments will be critical.

6.9 Extension Services

Extension services have become regarded as more and more necessary for agricultural development in particular, and for rural development in general.(59) In developed countries, extension services are seen to have played a vital role in improving agricultural efficiency and they could play the same role in improving agricultural efficiency in developing countries.(60) Agricultural development depends mainly on the willingness of farmers to accept changes, and these changes, technical and social, cannot be achieved without guidance through adequate extension services.(61) The conclusion of Section 6.8 emphasised the point that a significant

Table 6.21 Farming Operations in Iraq in 1971

Province	By the holder		Collectively		Through a Hired Manager		Unspecified		Total	
	No.	Area (Donums)	No.	Area (Donums)	No.	Area (Donums)	No.	Area (Donums)	No.	Area (Donums)
Nineveh	96,675	6,411,814	2,418	537,508	926	117,696	39	669	100,058	7,067,687
Arbil	35,919	1,619,069	1,143	88,855	298	35,947	1	7	37,361	1,743,878
Sulaimaniya	46,965	667,196	876	17,578	144	8,973	0	0	47,985	693,747
Kirkuk	42,070	2,745,993	1,411	144,221	244	36,234	5	0	43,730	2,926,448
Northern Region	221,629	11,444,072	5,848	788,162	1,612	198,850	45	676	229,134	12,431,760
Diala	32,058	1,532,393	2,230	287,433	190	73,639	5	55	34,483	1,893,520
Baghdad	41,291	1,310,238	1,609	172,176	292	151,417	6	32	43,198	1,633,863
Anbar	17,947	351,110	566	28,736	93	4,578	2	0	18,608	384,424
Kerbela	12,164	159,891	636	28,463	98	7,847	3	60	12,901	196,261
Babil	37,822	1,042,261	1,865	75,817	143	45,007	7	27	39,837	1,163,112
Central Region	141,282	4,395,893	6,906	592,625	816	282,488	23	174	149,027	5,271,180
Al-Qadisiya	40,538	1,136,604	2,151	144,480	572	87,889	6	130	43,267	1,369,103
Wasit	32,988	1,485,558	602	94,379	271	219,596	2	237	33,863	1,799,770
Maysan	41,486	609,324	188	8,715	379	42,519	3	40	42,056	660,598
Thi-Qar	60,375	1,056,605	1,153	21,513	1,242	110,915	10	0	62,780	1,189,033
Basrah	27,894	169,268	2,843	32,055	311	7,147	3	8	31,051	208,478
Southern Region	203,281	4,457,359	6,937	301,142	2,775	468,066	24	415	213,017	5,226,982
Grand Total	566,192	20,297,324	19,691	1,681,929	5,203	949,404	92	1,265	591,178	22,929,922

Source : Ministry of Planning 1973 : Results of 1971 Census of Agriculture, Table 3 , p.23.

number - the majority in fact - of landholders are individual decision makers to a considerable extent. Here an attempt is made to see the effect of Iraqi extension services on farmers' decisions.

Historically speaking, the Iraqi Extension Service is one of the oldest in the Arabic world going back to 1917 when the first Agricultural Department was established, whilst others started in 1953 in Egypt, 1954 in Jordan and 1959 in Syria. (62, 63) However, the activity of this department was very limited for a long period, being mainly concerned with introducing new cash crops such as cotton and seed distribution on a very limited scale. The IBRD estimated that there were only 25 qualified extension personnel in 1951 in Iraq and they emphasized the importance of building up the extension services. (64)

When in 1952 the Ministry of Agriculture was established and the Department of Agriculture was attached to it, experts on extension from the F.A.O and U.S.A. were requested to work in Iraq. Work started in three provinces, Baghdad, Basrah and Arbil, and spread until the extension services were expanded to cover the whole country by 1954. In 1958, those experts left, leaving behind a skeleton staff of qualified personnel.

Part of the land reform programme included in Law No. 4 of 1969 the establishment of the first General Directorate of Extension Services, and 172 personnel were then employed in it. (65)

6.10 Evaluation of the Extension Services in Iraq

There are many ways of evaluating extension services in a country.(66) The ratio of total expenditure on extension service to the total value of agricultural output, and the total expenditure per farm or cultivated unit are examples of these methods. Unfortunately, none of these methods can be applied in Iraq because expenditure information on extension services is not available. In this case the ratio of extension worker per holding or cultivated land area will be used as measures to analyse the impact of extension services on agriculture, this based on the pre- and post-land reform periods.

6.10.1 Extension Services Before Land Reform

The total number of qualified extension workers increased from 25 in 1951 to 86 in 1959. Table 6.22 shows the distribution of extension workers by provinces. It is clear from this table that Nineveh province, which has the largest provincial cultivated area, had the largest number of extension members in the country; 38.4 per cent of the total number of extension workers were in the Northern provinces.

Analysing the ratio of extension workers to the reported area of utilized land in the 1958/59 agricultural census, Table 6.23 reveals that the ratio was 373,893 donums (93,473 hectares) per extension worker, although this ratio varies from one province to another. These ratios are improved if the fallow land is excluded, but generally speaking were still too low to provide adequate extension services to farmers.

Regarding the ratio of extension workers to the number of holdings, Table 6.23 shows that there was one extension workers for each 2,945 holdings, again varying from one province to another. These ratios were high compared with their equivalent in other developed and developing countries.(67)

In addition to these low ratios of extension worker per holding or per donum there were other problems affecting extension services, such as the lack of transport media, the practice of sharecropping which affected the cooperation and coordination between extension workers and cultivators and frequently created a decision making vacuum, the relatively low qualifications of extension workers, a lack of demonstration equipment and finally the amount of time spent on non-extension work.

Bearing in mind all these factors, one might expect extension services to have had very little impact on agricultural production between 1952-59.

6.10.2 Extension Services During Land Reform

After the establishment of the General Directorate of Extension Services in 1969, extension services entered a new stage of development, the number of extension workers increasing from 86 in 1959 to 332 in 1970 and 383 in 1973, as shown in Table 6.22.

Considering the ratio of extension worker to the area of utilized land as reported in the 1971 agricultural census, Table 6.23 shows that there was a significant improvement in this ratio. The ratio decreased from 373,893 donums (93,473 hectares) in 1959 to 69,066 donums (17,267 hectares) per extension worker in 1971, i.e. the area per extension worker in 1971 was one fifth of that in 1959. This improvement can be seen in all provinces. This improvement of extension services, however, resulted from two factors: first, the fall in the reported utilized area in 1971 and secondly, the increase in the actual number of extension workers in 1970.

Furthermore, the ratios of extension worker per holding improved in spite of the increase in the number of holders. The number of holdings per extension worker decreased from 2,945 in 1959 to 1,781 in 1971. This improvement is mainly related to the increase of extension workers.

It is clear from the previous discussion that both ratios of utilized land and number of holdings per extension worker improved between 1959 and 1973. As to the effectiveness of work we have to examine other indicators.

6.11 Extension Centres

The distribution of extension services throughout the country reflects to a large extent the activities of extension services. Table 6.22 shows the number of extension centres in 1970 and 1973. It is obvious that the number increased from 153 in 1970 to 224 in 1973. Nonetheless, this number is less than the total number of (Nahia) (sub-district) in 1973 which was 232. If we assume that the provision of extension services at (Nahia) level is adequate to provide good extension services to farmers, it appears that some (Nahia) were deprived.

If we consider the average number of extension workers per centre, Table 6.22 reveals that this decreased from 2.2 in 1970 to 1.7 in 1973, this implying that opening new extension centres was proceeding faster than the recruiting of qualified personnel with consequent effects on the quality of extension services.

6.12 The Impact of Extension Services on Agricultural Production

Here it seems that the extension service was inadequate for the promotion of agricultural production or any other socio-economic factors despite the increase in number of extension workers and centres, such a view being confirmed by many studies.[68,69] For example, a study by Singh in 1970 stated that visits to three selected villages and interviews with a number of farmers in those villages gave the definite impression that the then existing extension agency had very little contact with farmers of the area.[70] This view was also confirmed in the 1971 agricultural census which showed that only 11 per cent of the holdings were visited by extension workers (see Table 6.24). Unfortunately, there are no very recent relevant data.

The inadequacy of services also tends to be reflected in the continued fluctuation in the annual yield per land unit (see Table 6.9), or the failure

Table 6.22 Number of Extension Workers, Extension Centres By Province

Province	1959	1970			1973		
	Extension Worker	Extension Worker	Extension Centre	Av.Ext. Worker per cnt.	Extension Worker	Extension Centre	Av .Ext. Worker per cnt.
Nineveh	13	25	16	1.6	40	22	1.8
Arbil	4	9	6	1.5	24	15	1.6
Sulaimaniya	7	16	9	1.8	17	15	1.1
Kirkuk	9	21	11	1.9	28	19	1.5
Northern Region	33	71	42	1.7	109	71	1.5
Diala	7	27	11	2.5	31	17	1.8
Baghdad	7	44	13	3.4	37	26	1.4
Anbar	6	23	11	2.1	33	14	2.4
Kerbela	3	13	6	2.2	8	7	1.1
Babil	4	39	18	2.2	32	16	2.0
Central Region	27	146	59	2.5	141	80	1.8
Al-Qadisiya	6	24	16	1.5	32	21	1.5
Wasit	6	27	9	3.0	32	12	2.7
Maysan	6	20	10	2.0	15	12	1.3
Thi-Qar	5	27	9	3.0	34	15	2.3
Basrah	3	17	8	2.1	20	13	1.5
Southern Region	26	115	52	2.2	133	73	1.8
Total	86	332	153	2.2	383	224	1.7

Sources : 1. Al-Farhan, M.M. et al (1973) ; The Extension Service in Iraq and The Methods of its Development, Ministry of Planning, Baghdad, Iraq, Table 1, p.51, and Table 2, p.58, (in Arabic).

2. Samman, B.B. (1973) : Some Light on Some Important Aspect of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq p.217 (in Arabic)

Table 6.23 Number of Holdings and Agricultural Area Per Extension Worker in Iraq

Provinces	1959		1970	
	Holdings per Extension Worker	Area (donums) per Extension worker	Holding per Extension Worker	Area (donums) per Extension worker
Nineveh	4,086	542,112	4,002	282,707
Arbil	4,406	599,276	4,151	193,764
Sulaimaniya	3,108	199,699	2,999	43,359
Kirkuk	1,925	388,586	2,082	139,355
Northern Region	3,328	434,537	3,227	175,095
Diala	2,625	441,675	1,277	70,130
Baghdad	1,210	346,352	982	37,133
Anbar	1,732	86,905	809	16,714
Kerbela	1,702	73,584	992	15,097
Babil	4,152	386,213	1,021	29,823
Central Region	2,184	289,008	1,021	36,104
Al-Qadisiya	4,150	422,049	1,803	57,046
Wasit	631	450,247	1,254	66,658
Maysan	1,853	359,056	2,103	33,030
Thi-Qar	4,512	452,134	2,325	44,038
Basrah	7,364	121,029	1,826	12,263
Southern Region	3,248	385,072	1,852	45,452
Total	2,945	373,893	1,781	69,066

Sources : calculated from Table 6.22 and Appendix B, Tables B

Table 6.24 Number of Holdings Reporting Official Visits in 1970/71

Province	Visits by Extension Worker			Visits by Cooperative Supervisor		
	No.of Holdings	No. of Visits	% to total Holdings	No. of Holdings	No. of Visits	% to total Holdings
Nineveh	8,072	24,214	8.0	10,247	66,528	10.2
Arbil	3,422	9,929	9.2	4,062	27,186	10.9
Sulaimaniya	4,463	32,200	9.3	5,854	98,696	12.2
Kirkuk	4,054	23,744	9.3	6,410	94,137	14.7
Northern Region	20,011	90,087	8.7	26,573	286,547	11.6
Diala	3,971	20,642	11.5	5,509	71,914	16.0
Baghdad	3,479	12,678	8.1	7,616	101,729	17.6
Anbar	2,525	11,109	13.6	1,999	27,837	10.7
Kerbela	1,669	9,058	12.9	2,979	49,500	23.1
Babil	2,920	14,999	7.3	9,245	115,618	23.2
Central Region	14,564	68,486	10.8	27,348	366,598	18.4
Al-Qadisiya	6,247	39,175	14.4	8,471	223,607	19.6
Wasit	5,029	55,573	14.9	12,429	224,359	36.7
Maysan	9,835	61,756	23.4	15,659	203,321	37.2
Thi-Qar	6,986	36,858	11.1	8,772	100,150	14.0
Basrah	2,562	9,474	8.3	1,975	16,905	6.4
Southern Region	30,659	202,836	14.4	47,306	768,342	22.2
Total	65,234	361,409	11.0	101,227	1,421,487	17.1

Source : Ministry of Planning (1973) : Results of 1971 Census of Agriculture, part one, Baghdad, Iraq, Table 50, p.164.

to increase productivity to a significant level.

The main reasons for this are sufficiently clear. First, the number of qualified extension workers in the mid 1970's was not sufficient to provide adequate services. For example, in the 1970-74 Economic Plan, that target was to reduce the number of holdings per extension worker to between 700-800, requiring 788 personnel in 1974. We have already seen that there were only 383 extension workers in 1973, and it was an impossible task to achieve the target in one year. Secondly, the continuing land distribution programme further increased the demand for extension workers, especially if the quality of services were to be maintained, let alone improved. Thirdly, transport and communications media are still a major problem. Fourthly, there was the excessive time which was spent on non-extension work. It seems that extension workers tend to be involved in many operations as part of their duties which have no direct relation to extension services.[71,72,73] Finally, the availability of demonstration equipment and the number of extension farms are still not adequate.

It appears rather difficult for the time being to provide adequate extension services on the basis of direct contact between farmers and extension workers, especially if one considers the number of holdings (see Table 6.21). It appears to be a more useful approach to use cooperatives as a basis for all extension services, such as demonstration, extension farms and other services. The success of this approach, however, tends to depend partly on the success of cooperatives themselves and partly on cooperation and coordination between both the extension service and other government departments.

6.13 Conclusion and Final Remarks

The formation, organization and distribution of any type of cooperative society require careful planning. Societies do not spring up overnight. The nature and needs of the group to be served must be evaluated, the problems involved in meeting those needs have to be understood, and the resources, both financial and human, required for the successful launching and conduct of cooperative society need to be assessed.[74]

Clearly the two main crucial factors for the establishment of successful farming cooperatives are evaluating people's needs and planning the form of organization, and the difficulties of doing this should not be as underestimated as apparently they have been in Iraq.

Cooperatives spread throughout the country as a result of compulsory membership demanded by the Land Reform Law of 1958. These cooperatives are under direct control of the government and their directors appointed by the government. Basically, the idea was that these cooperatives would fill the managerial vacuum left by the dispossessed landlords.

The success of agricultural cooperatives in Iraq as organizations aiming at the promotion of the socio-economic well-being of farmers and the technical factors of agricultural production was not comprehensive. Many factors have adversely affected the cooperative movement in Iraq. These factors may be grouped under two categories; internal and external. One of the internal factors is lack of education and interest in the farming community in the cooperative movement, and it appears that agricultural cooperatives are considered by too many farmers and officials as government offices requiring very little involvement of their members. The second factor is a shortage of working capital. Capital comes from two sources; paid-up capital by farmers themselves or government loans. Evidence from this chapter suggests that the available working capital is not enough to provide adequate services (see page 227). Costs of production are higher than the available working capital, and cooperative owned equipment, e.g. farm machinery, was not enough to provide adequate services. As a result of the demand for working capital being higher than that officially available to cooperative, farmers still depend on private institutions to supply credit in cash and kind. According to the 1971 agricultural census, the private sector then supplied I.D. 7.8 million as credit to farmers, five times higher than the government credit to cooperatives.

The external non-institutional factors consist of environmental factors such as soil salinization, the need for drainage and irrigation facilities, and the special needs of efficient dry-farming husbandry. These factors cannot be tackled effectively by cooperatives because of the large expenditures involved in relation to the low volume of working capital available to cooperatives.

Parallel to the cooperatives, the government directly intervened in agriculture by establishing state and collective farms. The main objectives are political and commercial. Politically, the government attempted to increase the importance of the public sector in agriculture. Commercially, the objectives were to use these production units to supply agricultural raw materials to local industry, as well as being extension or experimental farms for introducing new farming technology and new inputs. Unfortunately, these farms suffered from many setbacks because of the lack of managerial skill and overemployment in the context of the common basic environmental problem facing agriculture.

Apart from farming organizations, the government is also responsible for providing extension services to farmers. Evidence shows that extension service is still not at the stage of providing adequate cover. Shortages of skilled personnel, communication means, demonstration equipment and extension farms make the task very difficult to achieve, especially if the size of the agricultural area and the number of individual farms are taken into account.

A possible approach can be suggested to make a better use of available resources at least for the time being. Essentially this would be to use the cooperatives as the bases for extension services, whilst at the same time transfer more of the farming decision from individual farmers to the cooperative, e.g. establishing common rotation systems, as for example in Egypt, common weeding and harvesting practices, etc. This approach could be useful because it would free the extension worker or cooperative supervisor from travel and consequently leave more time for demonstrating new techniques based on local experience to farmers. It would also reduce the demand for scarce skilled human resources in the form of extension workers, and also for equally deficient material resources such as farm equipment and transport.

Even so, the success of such a programme would still depend on the coordination of and cooperation between different governmental offices, the availability of the essential services, i.e. capital, irrigation and drainage, and finally, above all, on the farmers' willingness to change and cooperate.

Having examined in this chapter the shortcomings of cooperatives and extension services in the context of expectations and performance, the study now proceeds to deal with technical factors affecting agriculture in Iraq, i.e. new input factors, mechanization, irrigation and drainage facilities, etc. and to examine their impact on agricultural productivity and production.

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SECTION THREE

CHAPTER SEVEN

NEW INPUT FACTORS

7.1 Introduction

During the consideration of socio-economic factors affecting agricultural production and productivity in the earlier Chapters it appeared that there are also other relevant, technical factors involved, in particular High Yield Varieties of crops (HYV's), fertilizers, mechanization, irrigation and drainage facilities.

The object of this part of the study is to assess the impacts of these factors on agricultural development as a whole, and agricultural production in particular, HYV's and fertilizers in this Chapter and the others in Chapters 8 and 9.

There is no doubt that HYV's and fertilizers, in association with other new inputs, are the most important factors recently resulting in a substantial increase in agricultural production in both developed and developing countries.[1] The impact of these combined factors has been called the Green Revolution. The impact of the green revolution is not only significantly important in increasing agricultural production, but also on the socio-economic condition of farmers, i.e. employment, income and its distribution.[2,3,4]

7.2 The Introduction of HYV's in Iraq

The introduction of HYV's in Iraq is not a new idea. It was started with cotton in 1927 when the government legislated to encourage farmers to use a new imported variety of seed which was followed by two further laws concerning wheat varieties.[5] Although such laws were passed decades ago, the farmers' response was very limited due to many inhibiting factors identified earlier, such as insecure land tenure, poor extension services and agricultural credits, as well as deficiencies in fertilizers, mechanization, irrigation and drainage facilities as we will see later.

In recent years because of the decline in supply of the principal food crops (i.e. wheat, barley and rice) on the one hand, and the increase in demand for them on the other, the government attempted to increase the area under HYV's, such as Mexipak and IR8 varieties in the case of wheat and rice respectively. Table 7.1 shows the imported quantity of HYV wheat seeds between 1965/66 and 1971/72. The main reason for the large increase in 1971/72 was crop failure in the previous seasons.

The second source of HYV seeds is from local production. Producing good quality HYV seeds requires three resources: operating farms, capital in processing and production, and administration in inspection and distribution. (6) Experience in other countries, India for example, shows that HYV's can be tailored to local conditions through local breeding. (7,8,9)

HYV seeds are produced in Iraq by farmers and state farms, and in 1966 the government, with the help of the F.A.O. established a Seed Production and Certificate Centre. (10) The objective is to certify and distribute HYV's to farmers in order to maintain the quality of HYV's in Iraq. Table 7.2 shows the quantity of HYV's produced by government agencies between 1971 and 1974, and it seems that these quantities are not sufficient to expand the area under HYV's, especially if one considers the size of the area under wheat and barley in Iraq. In addition, it seems that there is no firm policy which inspects and controls the quality of HYV's produced by individual farmers - in other words, farmers select their own seeds according to their experience. How far this affects the potential yield of HYV's is not very clear yet. (11)

Table 7.1 Iraqi Imports of HYV Wheat Seeds

Year	Metric tons
1965/66	5*
1967/68	800*
1971/72	70000**

* Mexipak

** Mexican varieties including Mexipak, Inia and Jori

Source : Dalrymple, D.G. (1974): Development and Spread of High Yielding Varieties of Wheat and Rice in the Less-Developed Nations, U.S.D.A. Report No. 95, Table 8,p.30.

Table 7.2 Quantity of HYV Seeds Produced by Government

Year	Wheat (Metric tons)	Barley (Metric tons)
1971	73	42
1972	49.5	22 + 74*
1973	47	18
1974	40.5	13.5 + 11*

* Animal foodstuff

Source : Ministry of Agriculture and Agrarian Reform (1974) : Agricultural Sector, Baghdad, Iraq, pp.46-47 (in Arabic)

7.3 Area Under HYV's

Data on the area under HYV's of major crops (wheat, barley and rice) are very scarce. The only available data are for three seasons, Appendix E, Table E.1 reveals, in detail, the cultivated area with wheat classified into four major varieties: Mexipak, other imported varieties, main local varieties and others. The cultivated area was also classified into the fertilized and unfertilized area, except for the 1970/71 season.

Analysing these data, Table 7.3 reveals that 17.4 per cent of the total cultivated area in 1970/71 was under Mexipak, this increasing to 35.4 per cent in 1972/73, i.e. it doubled in two seasons, whilst the area under other imported varieties decreased from 52.10 per cent in 1970/71 to 19.83 per cent in 1972/73.

As far as regional distribution is concerned, Table 7.3 reveals that Mexipak was less adopted in the rainfed area of Northern Iraq where only 2.11 per cent of the cultivated area with wheat was under the Mexipak variety in 1971, increasing to 11.5 per cent in 1972/73. Other imported HYV's covered a much larger area despite a decline from 63.5 per cent in 1971/72 to 27.7 per cent in 1972/73. It seems that about 53.6 per cent of the Northern region's cultivated area under wheat was sown with imported seed varieties (average over 3 years).

In the Central area, however, the proportion of the area under Mexipak increased from 39.30 per cent in 1970/71 to 74.66 per cent in 1972/73, or an increase of 35.4 per cent between 1970/71 and 1972/73. Other imported HYV's show less importance (see Table 7.3). Also, it is clear from Table 7.3 that about 74 per cent of the area under wheat production was cultivated with imported HYV's of wheat in the Central region (average over 3 years).

In the Southern region, the area under Mexipak increased from

34.6 per cent in 1970/71 to 75 per cent in 1972/73, or doubled in two years (see Table 7.3). As in the Central region, a large proportion of the area cultivated with wheat was under imported seed varieties.

The greater use of HYV's in the Central and Southern regions is mainly due to two factors. The assumed supply of water, essential if HYV potential is to be realised, encourages farmers in the Central and Southern regions to apply HYV's.(12) Conversely, uncertain weather conditions discourage farmers from using HYV's for rain-fed grain. Secondly, Government policy seems to have made HYV's more readily accessible in the Central and Southern regions.

Considering the use of fertilizers on the cultivated area under HYV's, Table 7.4 reveals that none of the cultivated area with HYV's was fertilized in the Northern region, and since this also meant that the potential productivity of HYV's could not be realised, HYV's were less attractive to farmers in the Northern region.

In the Central region, the fertilized area under Mexipak decreased from 36.0 per cent in 1971/72 to 22.24 per cent in 1972/73, and the same decrease occurred in the Southern region (see Table 7.4). This decrease, in spite of a decline in the prices of fertilizers (see p.85) was partly caused by such prices still remaining unattractively high relative to returns obtained by farmers and to the low levels of working capital available through cooperatives (see p.227). In addition, fertilizer supplies were inadequate.

Briefly, it is clear from the previous discussion HYV's of wheat are not significantly used in the rainfed Northern region, neither were fertilizers used there. In the Central and Southern regions, with more irrigation, a larger proportion of area under wheat was cultivated with HYV's but not all the area was fertilized.

Table 7.3 Area Cultivated with Imported Seed Varieties

Province	1970/71		1971/72		1972/73	
	Mexipak %	Other imported varieties %	Mexipak %	Other imported varieties %	Mexipak %	Other imported varieties %
Ninevah	0.99	83.3	15.50	48.6	18.1	54.9
Arbil	2.69	31.3	4.20	46.1	2.94	21.97
Sulaimaniya	3.23	0.62	23.44	20.52	25.90	13.94
Kirkuk	4.10	64.20	2.91	43.10	6.18	8.43
Northern Region	2.11	63.47	10.98	45.15	11.45	27.69
Diala	7.71	53.89	23.59	8.59	28.50	0.67
Baghdad	65.81	9.90	77.48	12.10	91.03	6.04
Anbar	29.90	34.85	51.89	19.00	82.95	8.99
Kerbela	54.22	-	100.00	-	100.00	-
Babil	53.60	28.10	83.20	4.00	94.49	3.23
Central Region	39.29	31.50	61.15	10.26	74.66	4.26
Al-Qadisiya	21.68	3.46	83.94	0.12	92.91	0.15
Wasit	34.19	55.50	67.34	7.47	65.91	21.65
Thi-Qar	39.31	59.54	65.45	3.24	76.68	0.67
Maysan	45.89	54.11	56.33	-	65.96	-
Basrah	100.00	-	100.00	-	100.00	-
Southern Region	34.60	42.9	72.79	3.54	75.01	10.03
Iraq	17.35	52.10	24.94	35.59	35.39	19.83

Source : Calculated from Appendix E, Table E.1.

Table 7.4 The Percentage of Fertilized Area Cultivated with Imported Wheat Seeds Varieties to the Total Area Under HYV's

Province	1971/72		1972/73	
	Mexipak	Other Imported varieties	Mexipak	Other Imported varieties
Ninevah	0	0	0	0
Arbil	0	0	0	0
Sulaimaniya	0	0	0	0
Kirkuk	0	0	0	0
Northern Region	0	0	0	0
Diala	45.7	7.64	8.23	0
Baghdad	31.98	17.00	16.52	1.19
Anbar	59.00	1.75	25.42	3.85
Kerbela	16.35	-	16.41	-
Babil	36.20	1.43	39.20	6.56
Central Region	36.00	11.56	22.24	2.45
Al-Qadisiya	5.92	0	2.30	0
Wasit	37.73	22.10	14.49	1.15
Thi-Qar	50.37	0	32.26	0
Maysan	57.58	0	2.5	0
Basrah	-	0	5.8	0
Southern Region	27.22	18.28	12.46	1.14
Iraq	21.42	0.68	14.22	0.21

Source: Calculated from Appendix E, Table E.1

7.4 The Yield of HYV's

Data on the yield of HYV's in farm production are not available, but information on the performance of HYV's is obtained from experimental stations. Tables 7.5 and 7.6 show the average yield of two HYV's of wheat and barley in three experimental stations in the rainfed area of Northern Iraq. No further information on the experimental procedures is available for irrigation, fertilizer application, soil conditions and environmental control.

Nonetheless, two major points appear from these tables. First, the average yields of HYV's of wheat and barley on these stations were far higher than the provincial farm yields. The Mexipak variety of wheat produced between 2.8 to6.3 times higher average yield than the traditional variety in the province itself. In the case of barley, the Irevat variety produced between 2.8 to 4.4 times higher average yield than the local variety in the province. These facts at least illustrate HYV yield potential. The second point to emerge is that there was a wide fluctuation in the annual yield of HYV's both at and between all experimental stations. Similar variations over time of the average yield of HYV's are also noticeable at the irrigated experimental station. [13] In all cases, unfortunately, we cannot distinguish between the effects of management variability and those of variations in environmental growing conditions.

In reality, how much have HYV's affected wheat and barley productivity in Iraq? To answer this question we have to use several different types of evidence. First, we have seen that the average yield of wheat and barley in Iraq did not significantly increase after the 1958 revolution (see Table 6.9). Secondly, it is clear from Tables 7.5 and 7.6 that the average yield HYV's of wheat and barley even at

Table 7.5 Yield of Local and HYV of Wheat and Barley at Experimental Farms and in Ninevah Province (kg/donum)

Year	Mosul Experimental Farm				Telafar Experimental Farm				Ninevah Province	
	Wheat		Barley		Wheat		Barley			
	Mexipak	Sentor	Irevat	Black	Mexipak	Sentor	Irevat	Black	Wheat	Barley
1967/68	-	-	-	-	673	-	-	-	180	226
68/69	612	176	-	-	609	-	-	-	150	259
69/70	1056	580	-	629	338	-	-	-	125	145
70/71	984	458	674	600	-	-	-	-	105	97
71/72	782	156	805	942	557	521	805	478	335	372
72/73	-	-	-	-	-	-	-	-	79	90
73/74	1230	500	1173	888	289	260	418	367	152	186
74/75	1046	273	739	493	42	113	62	109	95	123
75/76	983	372	716	429	525	326	847	704	-	-
Average	956.1	359.3	821.4	663.0	433.3	305.0	533.0	414.5	152.6	187.3

Source:- El-Yussif, F.Y. (1979) : Hydrological, Meteorological, and Agricultural Relations in Northern Iraq, Water Resources Bulletin, vol. 15, No.3, pp.753-765

Table 7.6 Yield of Local and HYV of Wheat and Barley at Experimental Farm and in Sulaimaniya Province (Kg/donum)

Year	Bakarajo Experimental Farm				Sulaimaniya Province	
	Wheat		Barley			
	Mexipak	Sentor	Irevat	Black	Wheat	Barley
1971/72	653	533	649	153	306	226
72/73	850	510	-	-	303	376
73/74	642	419	353	210	302	303
74/75	688	574	857	769	314	283
75/76	665	670	716	426	-	-
Average	699.6	541.2	644	389.5	306.3	297

Source : As in Table 7. 5.

experimental stations fluctuated annually in the early 1970's and there was no sign of any trend towards higher yields. Thirdly, the potential yield of HYV's probably was not realised because of insufficient use of fertilizers in Iraq (see Table 7.4). In combination, these disparate but only available pieces of evidence suggest that the impact of HYV's in improving wheat and barley productivity was not significant, and this point will be discussed further below.

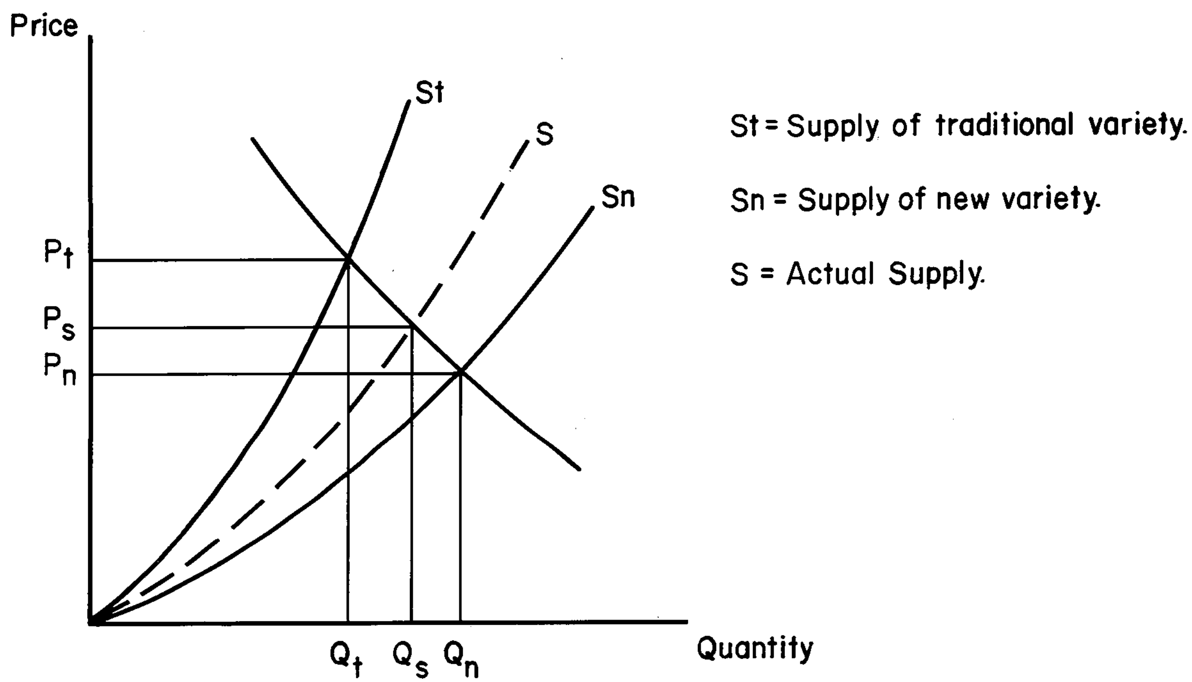
7.5 The Contribution of an HYV (Mexipak) to the Total Production of Wheat

Theoretically speaking, HYV's have the potential to produce considerably more than the local varieties, estimated at between two to three times in the case of wheat and up to twice as much with rice, but, in reality, this is seldom fully achieved.[14] The reasons for this generally centre about poor water control, lack of fertilizers, and inadequate weed and pest control. In areas where these problems are critical, HYV's may produce no more or even less than local varieties.[15]

However, the application of an HYV "package" in the right environment has three possible outcomes : (1) output is expanded at the same overall cost, (2) the same output can be produced at lower cost, and (3) some combination of the two results.[16] Fig. 7.1 shows the impact of an HYV's package on shifting the supply curve. Where S_n is the potential high yield of HYV's (at experimental Stations), S_t is the yield of local varieties. The shift in the supply curve (S) from left to right will obviously depend upon the area under HYV's and the yield of HYV's itself. If HYV's achieve optimum or potential level, the supply curve (S) will shift more to the right and vice-versa.

There are two main methods which can be used to study the contribution of HYV's to the total production. First, by applying production

Fig 7·1 THE EFFECT OF HYV's ON SHIFTING SUPPLY CURVE



function analysis. This method requires considerable detail concerning input factors, e.g. fertilizers, labour, area, etc. for a sufficient time period to allow such techniques to be used. Evenson applied this approach in his analysis to the contribution of HYV's in different parts of the world, and this approach has also been applied in the Punjab.[17,18] Lack of statistical data prevent us from using this technique in this study.

The second approach, called "Index Number", was applied by D.G. Dalrymple in her study of the contribution of HYV's to wheat and rice production in Asia. This approach is simple and consists of the following stages:-

1. Estimated yield of traditional varieties (Y_t)

where $$Y_t = \frac{Q_T}{A_t + (A_{hyv}.K)} \qquad \text{-----------} \quad (1)$$

2. Total production if total area planted to traditional varieties (Q_t)

$$Q_t = Y_t . A_T \qquad \text{-----------} \quad (2)$$

3. Additional production due to HYV's package (Q_{hyv})

$$Q_{hyv} = Q_T - Q_t \qquad \text{-----------} \quad (3)$$

where

Y_t	=	Yield of traditional varieties.
Q_t	=	Production of traditional varieties.
A_t	=	Area under " " .
Q_T	=	Production of all varieties.
A_T	=	Area under all varieties.
Q_{hyv}	=	Production of HYV's.
A_{hyv}	=	Area under HYV's.
K	=	$\frac{Y_{hyv}}{Y_t}$

The value of K is estimated, as suggested by D.G. Dalrymple at different levels : 1.25, 1.50, 1.75 and 2.0. In Asian countries, K was established at 1.25 for rice and 1.50 for wheat by D.G. Dalrymple.(19)

Here, we will try to apply this technique on Iraqi data for the 1970/71, 1971/72, 1972/73 seasons. Table 7.7 shows the contribution of Mexipak variety of wheat to regional and national production for various K values. Analysing this table reveals the following points. First, the Mexipak variety of wheat did not significantly contribute to the total wheat production in the Northern region in the three seasons under the study. The probable reasons for this are : (a) the relatively small area under the Mexipak variety of wheat (see Table 7.3). (b) little or no use of fertilizers, and (c) traditionally yields in the rainfed area are low compared with the irrigated areas of the Central and Southern regions. This last point together with the considerable annual fluctuations, imply that environmental conditions had a critical effect on yields. This is discussed later in Chapters 12 and 13.

If formula (1) is modified using two K values for the fertilized and unfertilized area under HYV's there is no significant difference in the results. This is primarily because only a very small area under HYV's was fertilized.

Is it then possible to determine the value of K for Iraq from this exercise? Only by comparing our results with other studies. Table 7.8 shows the proportion of HYV's of wheat to the total production in Iraq and Asian countries using the Index Number technique. It is clear that the percentage of HYV's to the total wheat production in Iraq was very close when K levels are 1.25 and 1.50. When K is a higher value, the contribution of HYV's in Asian countries was much higher. Therefore, even when we use a high K value, the supply response of HYV's in Iraq was small.

Table 7.7 The Contribution of Mexipak Production (00 metric tons) and its Proportion of Total Production

K level	North		Centre		South		Iraq	
	Production due Mexi-pak	% to total Production	Production due Mexi-pak	% to total Production	Production due Mexi-pak	% to total Production	Production due Mexi-pak	% to total Production
1970/71								
1.25	16	0.53	238	8.94	200	7.95	342	4.16
1.50	32	1.05	437	16.42	371	14.74	656	7.98
1.75	48	1.58	606	22.77	519	20.62	947	11.52
2.0	63	2.07	751	28.22	647	25.71	1216	14.79
1971/72								
1.25	462	2.67	700	13.26	569	15.40	1541	5.87
1.50	899	5.20	1237	23.42	986	26.69	2911	11.09
1.75	1315	7.61	1661	31.45	1305	35.33	4137	15.76
2.0	1709	9.89	1903	36.03	1556	42.12	5241	19.96
1972/73								
1.25	95	2.79	524	15.73	448	15.79	778	8.13
1.50	184	5.41	905	27.16	774	27.27	1438	15.03
1.75	269	7.91	1196	35.89	1022	36.01	2007	20.97
2.0	349	10.26	1424	42.74	1216	42.85	2501	26.13

Source : Calculated from Appendix E, Table E.1.

Table 7.8 The Contribution of HYV's to Total Production

K level	Iraq[1] %	Asia[2] %
1.25	8.13	9.1
1.50	15.03	18.3
1.75	20.97	27.9
2.0	26.13	36.6

Sources : 1. Table 7.7.

2. Dalrymple, D.G. (1975) : Measuring The Green Revolution, U.S.D.A, Washington, Table 7, page 35.

Furthermore, the contribution of HYV's of wheat to total wheat production in the irrigated area of Central and Southern Iraq at K equal to 1.50 ranged between 23.42 per cent in the Central region in 1971/72 to 27.27 in the Southern region in 1972/73, and this contribution was very close to the average contribution of HYV's Evenson has mentioned (1970/71 was excluded because of bad weather conditions).(20)

From this analysis one may assume that the K value for Iraq is between 1.25 to 1.50 according to the prevailing irrigation and environmental conditions. This value could be improved if environmental conditions and farming practice are improved in the country. From the economic point of view, if these figures are converted into monetary values HYV's can be seen to have significant importance to farmers' income, assuming that there are no price fluctuations.

We can, therefore, state that in terms of production, productivity and farm incomes, HYV's in Iraq were neither sufficiently extensively utilized in the rainfed areas nor supported by good farming practice, e.g. using fertilizers. In the irrigated areas, land under HYV's has expanded significantly in recent years, but the farming practices necessary to exploit the potential of HYV's are not fully implemented. (21)

7.6 Fertilizers

No doubt, fertilizer is one of the factors which may help to improve agricultural productivity and production. (22) Mellor noted that in practice we find that in most countries of the world the average response to fertilizers over the years has been an additional ten pounds of food grains or their equivalent for each pound of inorganic nitrogen. (23) But, nonetheless, the effectiveness of fertilizers depends upon a proper combination of soil and crop management practice. In the absence of such management, fertilizers may have no significant effect on productivity or sometimes will have negative consequences.

The purpose here is to assess the overall view of the use of fertilizers (organic and inorganic) in Iraq by assuming two main points : first, the application of fertilizers in Iraq and secondly, factors affecting the use of fertilizers.

Broadly speaking, in the pre-land reform period before 1958, commercial fertilizers were not used except perhaps on some highly profitable crops, such as fruit and vegetables. Increasing production of the staple crops, i.e. wheat and barley, was based on expanding the cultivated areas.

7.7 Organic Fertilizers (FYM)

Using organic fertilizers or farm yard manure (FYM) was not a common practice in Iraq, especially before 1958. The main reasons are : first, farmers were not aware of the importance of FYM in providing soil with nutrient. Secondly, FYM was/is collected, dried and used as fuel - a common practice in many Middle-East countries.[24] Thirdly, using FYM in production requires extra labour inputs, but this point was not significantly important, especially before 1958 when the labourers were available and cheap. The only manure left on the ground followed the grazing of livestock on fallow land. To study the effect of FYM on agricultural production, one has to examine, first, the average use per donum, secondly, the area fertilized and thirdly, the number of holdings applying fertilizers.

7.7.1 The Average Use of Organic Fertilizers

The limited data available on FYM reveal that the average use of FYM in Iraq was 1.4 metric ton per donum in 1971 (5.6 metric tons per hectare) as shown in Table 7.9. On a regional basis, it seems that the average use of FYM in the Central and Southern regions was 1.6 metric tons per donum (6.4 metric tons per hectare) compared with the average use of 1.2 metric tons per donum (4.8 metric tons per hectare) in the Northern region.

At the provincial level Table 7.9 shows there was a variation in the level of fertilization, and these variations may be explained by differences in farming systems, for example cereals in the north, fruit and vegetables in Diala and Kerbela, along with variations in soil conditions. We also have to remember the large margins of error in the statistical data given that FYM is mainly produced on farms and most farmers do not measure the amount they used.

Without any doubt any level of fertilization will bring certain improvements in production, but without knowing the actual requirement of organic fertilizers per donum it is rather difficult to measure the supply response of crops to the level of organic fertilization in Iraq. Appendix E, Table E.3 shows what detail is available on organic fertilizers.

7.7.2 Number of Holdings where FYM was applied

Table 7.10 reveals that only 18 per cent of the total number of agricultural holdings applied organic fertilizers according to the 1971 agricultural census (the most recent data accessible), i.e. only one-fifth of the agricultural holdings applied FYM. On a regional basis, we see that only 17 per cent of the holdings in the Northern region applied FYM compared with 31 per cent in the Centre, this associated with the concentration of fruit and vegetable production in this region. This point becomes even clearer if one considers the provincial percentage of holdings using FYM, especially in Kerbela and Babil provinces. In the Southern region, FYM was less commonly used than in the Central and Northern regions, only 7.3 per cent of the holdings applied FYM there, except in Basrah province which shows a higher percentage.

7.7.3 The Fertilized Area

Considering the ratio of total agricultural area where FYM was applied to the total utilized area in 1971, reveals that only 2.2 per cent was fertilized with FYM in the whole country (see Table 7.10) - a very low ratio indeed. Even if the utilized area is adjusted to take account of fallow land and natural pasture, this ratio would not improve significantly. In other words, FYM was only used in areas under certain crops, such as fruit and vegetables, this again reinforced by the provincial distribution of the fertilized area.

Summing up we see that FYM was only used in the area producing certain crops, such as fruit and vegetables. As for other crops, e.g. wheat and barley, there is no evidence the FYM was applied on a large scale (see Table 7.10).

7.8 Chemical Fertilizers (Inorganic Fertilizers)

In Iraq, we do not know when chemical fertilizers were introduced to the country. But, as we can see from the import figures in Appendix E, Table E.2, chemical fertilizers were probably introduced on a significant scale to the country in the nineteen sixties.

Chemical fertilizers are supplied by the following organizations:-

1. Through supervised credit

Since 1965 farmers who are not members of agricultural cooperatives may obtain supervised credit from the General Directorate of agriucltural Extension Services.[25] Table 7.11 shows the amount of chemical fertilizers distributed in this way between 1961 and 1970 and it is clear chemical fertilizer supplies increased significantly from 1967 onwards. Unfortunately, there is no further information available beyond 1970, but we believe that the positive trend may have continued. Table 7.13 reveals that 16.3 per

Table 7.9 The Average Application of Fertilizers (metric tons) per Holding and per Donum in 1970/71

Province	Organic fertilizers		Chemical fertilizers	
	Ton/holding	Ton/ Donum	Ton/holding	Ton/ Donum
Ninevah	7.1	1.5	0.5	0.06
Arbil	3.9	0.7	0.5	0.05
Sulaimaniya	2.6	0.7	0.2	0.04
Kirkuk	11.2	2.0	0.7	0.05
Northern Region	5.4	1.2	0.4	0.05
Diala	7.7	2.0	0.4	0.06
Baghdad	12.2	1.4	0.9	0.06
Anbar	6.9	1.6	0.6	0.05
Kerbela	11.9	2.1	0.6	0.06
Babil	7.4	1.4	0.5	0.06
Central Region	9.11	1.6	0.7	0.06
Al-Qadisiya	19.0	1.1	0.9	0.06
Wasit	9.2	1.4	0.7	0.05
Thi-Qar	5.2	1.5	0.2	0.01
Maysan	6.5	0.03	0.13	0.03
Basrah	5.3	1.9	0.25	0.08
Southern Region	6.5	1.6	1.5	0.05
Iraq	7.4	1.4	0.6	0.06

Source : Calculated from Appendix E, Table E.3.

Table 7.10 The Percentage of Holdings and Area Using Fertilizers to the Total Holdings and Total Area Respectively

Province	Organic fertilizers		Chemical fertilizers	
	No.of Holdings to Total Holdings	Area Fertilized to Total Area	No.of Holdings to Total Holdings	Area Fertilized to Total Area
Ninevah	15.5	0.98	6.9	0.8
Arbil	21.1	2.4	1.9	0.5
Sulaimaniya	24.7	6.0	13.8	3.9
Kirkuk	28.2	0.5	2.7	0.5
Northern Region	16.9	1.4	6.8	0.8
Diala	35.0	2.3	24.2	2.9
Baghdad	35.0	6.5	60.2	18.6
Anbar	24.0	3.9	26.2	10.1
Kerbela	45.8	15.5	70.3	41.1
Babil	45.7	7.9	47.1	13.0
Central Region	30.8	4.1	36.3	8.9
Al-Qadisiya	0.7	0.36	27.6	11.7
Wasit	9.1	1.0	22.3	5.7
Thi-Qar	0.9	0.15	3.1	4.9
Maysan	0.14	0.15	24.7	7.0
Basrah	29.1	10.9	30.9	12.9
Southern Region	7.3	1.4	22.8	11.5
Iraq	18.2	2.2	20.5	4.9

Sources : Calculated from Appendix E, Table E.3.

cent of the chemical fertilizers was supplied through supervised credit in 1970.

Table 7.12,the regional distribution of chemical fertilizers supplied through supervised credit, reveals that most were distributed in the Central and Southern regions. This emphasis is associated with the strong encouragement of the use of fertilizers in rice production (mainly produced in the Central and Southern regions), whilst the concentration of fruit and vegetable production in these regions may also have had an effect on their use.(26)

2. Through Cooperatives

Farmers submit their requirement of chemical fertilizers to their cooperatives which then collect these requests and make a uniform order to the General Directorate of Agricultural Production and Cooperative; this office in turn makes orders on behalf of cooperatives from the State Chemical Imports and Distribution Company (SCIDC) which was established in 1965 (see p.220). The total volume handled in this way in 1970 appears in Table 7.13.

3. Direct Purchase

Farmers can also purchase their requirement of chemical fertilizers directly from SCIDC agents throughout the country and from Table 7.13 we see that direct purchase was the most significant supply result, i.e. 68 per cent of chemical fertilizers was supplied through this method in 1970. Meanwhile, the cooperatives supplied only 8.6 per cent of the chemical fertilizers in 1971 which was relatively very small, and this is probably another example of the inefficiency of the cooperatives in Iraq. Also, this confirms the need to improve extension services to obtain better results from fertilizer use.

Table 7.11 Chemical Fertilizers Distributed by Extension Depts. in Provinces
(Tons)

Province	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Ninevah	2.6	-	-	-	-	-	-	504.7	529.0	526.5
Arbil	-	.50	1.2	0.6	.8	1.8	8.4	8.8	99.5	157.5
Sulaimaniya	.2	-	-	2.1	4.8	-	1.0	144.4	-	49.5
Kirkuk	8.9	-	-	-	2.0	5.1	7.1	139.2	246.8	468.8
Northern Region	11.7	.50	1.2	2.7	7.6	6.9	16.5	797.1	875.3	1202.3
Diala	-	-	-	-	-	-	16.0	230.0	493.0	910.0
Baghdad	.7	2.4	.4	2.5	.5	2.4	2.0	871.9	412.9	325.8
Anber	.6	6.8	4.1	1.0	7.4	7.2	16.6	107.0	496.0	1038.0
Kerbela	5.2	2.7	.2	.8	6.9	2.2	511.6	910.0	1076.0	1206.5
Babil	1.1	1.3	2.3	3.8	5.3	9.0	652.3	2496.9	1102.6	986.1
Central Region	7.6	13.2	7.0	8.1	20.1	20.8	1198.5	9615.8	3580.5	4466.4
Al-Qadisiya	4.7	8.1	.4	.1	12.8	53.3	12.9	33.5	4955.3	434.9
Wasit	-	10.0	2.2	2.5	3.0	8.5	2167.0	2678.0	2155.0	3330.0
Thi-Qar	.4	18.3	.1	.5	.6	3.7	11.8	145.2	202.5	103.0
Maysan	-	10.8	.1	1.8	6.5	13.4	1144.8	1198.0	92.4	26.5
Basrah	-	-	-	-	-	-	-	-	2.5	114.5
Southern Region	5.1	47.2	2.8	4.9	22.9	78.9	3336.5	4054.7	7407.7	9008.9
Iraq	24.4	60.9	11.0	15.7	50.6	106.6	4551.5	9467.6	11863.5	9677.6

Source : Rashid, M.N. & Al-Bandar, T. (1972) : The Chemical fertilizers in Iraq, Ministry of Planning, Baghdad, Iraq, Table 6, p.31, (in Arabic)

Table 7.12 The Regional Distribution of Chemical Fertilizers Through Supervised Credit (percentages)

Region	1965	1966	1967	1968	1969	1970
North	15.0	6.5	0.4	8.4	7.4	12.4
Central	39.7	19.5	26.3	48.8	30.2	46.2
South	45.3	74.0	73.3	42.8	62.4	41.4

Source : Calculated from Table 7.11

7.9 The Average Use of Chemical Fertilizers

Data on chemical fertilizers are very scarce and fragmented, especially on consumption per donum. Data on average consumption of chemical fertilizers per donum are available from the 1971 agricultural census, Table 7.9 shows the average consumption per donum. It is clear from this table that average consumption per donum was 0.06 metric ton per donum (0.24 metric ton per hectare) and there was no significant difference on a regional or provincial basis, except for abnormally low rates in Thi-Qar and Maysan and above average rates in Basrah. All rates are low compared with the recommendation application rate for Mexipak wheat of 0.075 and 0.175 metric tons per donum in the rainfed and irrigated areas respectively.(27)

7.10 Number of Holdings Where Chemical Fertilizers were Applied

Table 7.10 also reveals that only 20.5 per cent of all holdings in the country applied chemical fertilizers in 1970/71. The highest regional percentage of holdings applying chemical fertilizers was 36.3 in the Centre, followed by the Southern and Northern regions with 22.8 and 6.8 per cent respectively. The provincial distribution reinforces this pattern which is explicable on the same basis as for FYM (see p.277).

7.11 The Fertilized Area

Table 7.10 further reveals only 4.9 per cent of the cultivated area was fertilized in 1970/71 in Iraq. On a regional basis, the Southern region shows the highest percentage of fertilized cultivated land which was 11.5 per cent, the Central region following with 8.9 per cent. In the Northern region, only 0.8 per cent of the cultivated area was fertilized. The reasons for this regional variation are the same as for FYM (see p.277).

Table 7.13 The Amount of Chemical Fertilizers Distributed by Schemes in 1970

Schemes	Tons	%
1. The General Directorate of Agricultural cooperation	5,085	8.6
2. The General Directorate of Agricultural Extension services	9,605	16.3
3. Other Organizations	4,141	7.1
4. Direct purchase	40,082	68.0
Total	58,913	100

Source: Rashid, H.N. & Al-Bandar, T. (1972) : The Chemical Fertilizers in Iraq, Ministry of Planning, Baghdad, Iraq, Table 16, p.52 (in Arabic).

Another source of data is provided by the CSO Table 7.14 showing the percentage of fertilized area with chemical fertilizers under wheat, barley and rice production in three seasons between 1971/72 and 1973/74. The following main points appear from this table:-

1. In the Northern region wheat and barley were still grown largely without chemical fertilizers. This situation is also confirmed by a study carried out by the Ministry of Agriculture in 1968/69.[28,29]

2. In the Central region an average of 19 per cent (average over 3 years) of the total area under wheat crop was fertilized, whilst a much smaller area under barley was fertilized. A large area under rice was fertilized with chemical fertilizer, although it declined in 1973/74.

3. In the Southern region, nearly 14.3 per cent (average over 3 years) of the area under wheat production was fertilized with chemical fertilizer, whilst only 1 per cent of area under barley was fertilized. The fertilized area with chemical fertilizers under rice production dropped from 48.4 per cent in 1972 to 29.5 per cent in 1973.

Appendix E, Tables E.4, E.5 and E.6 show the areas on which chemical fertilizers were applied for each crop.

In summary, we see that the rate of application of chemical fertilizers was low. In the Northern region, wheat and barley production proceeded without any chemical fertilization, whereas in the Central and Southern regions these cereals received some fertilizers. Rice production in the Central and Southern regions was generally associated with the use of fertilizers. Appendix E, Tables E.7 shows the consumption of chemical fertilizers in Iraq between 1961/62 and 1977/78.

7.12 Factors Affecting the Use of Chemical Fertilizers

The use offertilizers, and especially chemical fertilizers, depends on a balance of factors, environmental, economic and technical and on the role of cooperative and extension services in the country.

It seems certain that environment condition influences farmers'

Table (7.14) The Percentage of Fertilized Area to Total Cultivated Area

Province	Wheat			Barley		Rice	
	1971/72	1972/73	1973/74	1972/73	1973/74	1973	1974
Ninevah	0	0	0	0	0	28.5	0
Arbil	0	0	0	0	0	0	8.3
Sulaimanya	0	0	0	0	0	61.8	-
Kirkuk	0	0	0.5	0	0	6.5	2.2
Northern Region	0	0	0.12	0	0	20.8	2.8
Diala	11.6	2.5	7.9	0.6	1.9	-	-
Baghdad	27.1	15.1	17.9	7.7	8.7	-	61.1
Anbar	37.4	22.7	8.3	4.6	2.3	-	-
Kerbela	16.3	16.4	33.8	19.8	2.0	100.0	80.0
Babil	33.5	37.3	33.9	4.5	6.5	0	-
Central Region	24.4	16.9	16.8	4.2	5.4	99.8	79.7
Al-Qadisiya	5.1	2.1	1.0	0.6	0	92.3	95.1
Wasit	27.2	9.9	19.4	2.0	3.4	-	-
Thi-Qar	33.0	24.7	13.5	0	0	0	0.2
Maysan	32.8	1.6	3.4	0	0	0.96	28.0
Basrah	0	5.8	0	0	0	70.6	5.1
Southern Region	20.6	9.5	12.8	1.0	1.6	48.4	29.6
Iraq	5.8	5.1	3.8	1.6	2.0	53.0	35.4

Source : Calculated from Appendix E, Tables E.4, E.5 and E.6

appreciation of fertilizers in Iraq. In the rainfed area of the north limited use of fertilizers may be caused by the dominance of variable weather conditions, especially rainfall, which lower the yield effectivity of fertilizers and discourage farmers from using them. Conversely, in the irrigated areas of the Central and Southern regions, the availability of irrigation water may encourage farmers to use fertilizers to a certain extent. Nonetheless, soil salinity in these regions may be an inhibiting environmental influence, analogous to rainfall variability in the north.

The role of prices and/or the cost of fertilizers can be significant in affecting the use of fertilizers. There are two different relationships involved here. First, there is the relationship between the price of fertilizers and the prices received by farmers for their products; to some extent this varies with crop type. Secondly, there is the relationship between the price of fertilizers, especially chemical ones, and the price of other input factors. Both of these points need further study to ascertain their impact on the use of fertilizers in Iraq, but the only data available is that of the reduction in the controlled price of chemical fertilizers by 30 per cent in 1974. Then, farmers' response was not very high. [30] Another economic factor is the availability of capital.

It is clear from previous discussion that adequate working capital is not available through cooperatives and the use of capital obtained from the private sector for the purchase of fertilizers means a high cost (see Table 6.8).

The availability of other input factors, such as plant protection, mechanisation, irrigation, drainage and know-how, are essential for plant response to fertilizers, and their provision is necessary to encourage farmers to apply fertilizers. In the case of know-how, we have already noted the inadequacy of cooperatives and extension services in providing good services to farmers. Weed suppression and plant protection are not common, especially in the case of the staple grain crops. The other input factors are discussed in following chapters.

Institutional factors are also relevant. We have already seen that land tenure insecurity has been a problem in Iraq which might adversely affect many inputs, including fertilizers (see chapter 5).[31] The pre-1958 farming system, involving sharecropping and poor farm-tenant relations and the post 1958 uncertainties associated with land reform have also slowed down the spread of fertilizer use in Iraq (see chapter 5).

As far as the physical availability of the appropriate fertilizers at the required locations and periods is concerned, then this depends on raising the efficiency of government agencies which are responsible for importing, producing and distributing chemical fertilizers throughout the country.

7.13 Rotation System

World experience shows that the effectiveness of fertilizers is increased when appropriate crop rotations are applied, particularly to annual crops such as cereals and forage and fodder crops which are in the ground for a few seasons. Physical advantages lie in improving soil structure and nutrient availability by cultivating different crops in sequence, wheat after legumes, for example. Further economic advantages follow through increasing the crop range, raising farming efficiency, the better use of labour force and mechanization and, ultimately, increasing farmers' incomes.

In spite of these potential advantages, rotation systems are not applied in Iraq and instead we have a crop-fallow sequence. In this latter system half the land is left idle or fallow for a whole season in the cereal-dominated rainfed areas. Even in the irrigated areas only a small proportion of land is cultivated in the summer and on most holdings an annual fallow is also used. In traditional agricultural thinking, an annual fallow allows soil fertility to recover and provides rough grazing for livestock. In the irrigated areas there is some saving of water which is never sufficiently available and a dry-fallow is also believed to reduce salinization. In the rainfed areas there can also be some build up of soil-moisture but this is very limited without the use of true dry-farming techniques.

Here again there is an opportunity not yet taken to improve the productivity of land use but this requires a whole package of improved techniques, inputs and advice. As it is, the annual fallow is a simple minimum-input, low yield response to the climatic regime and other environmental factors.

7.14 Conclusion and Final Remarks

In this chapter the impact of some new input factors, i.e. HYV's and fertilizers on agricultural productivity and production in Iraq were discussed.

HYV's are used more in the irrigated areas of the Central and Southern regions of Iraq than in the rainfed area in the north. Yields of HYV's annually fluctuate according to available data. The production contribution of one HYV, the Mexipak variety of wheat, ranged around 25 per cent in the irrigated areas and very much below that in rainfed areas (see Table 7.7), and the elasticity of the supply factor effect of Mexipak variety of wheat is as low as 1.25 to 1.50.

Chemical fertilizers seem generally to be applied below required rates (1971 agricultural census). In the arable dry farming of Northern Iraq, chemical fertilization was not a very common practice. In the irrigated areas of the Central and Southern regions, the use of chemical fertilizers tends to be associated with fruit and vegetable production more than cereal production, although chemical fertilizers were mainly applied with HYV's of wheat. The only crop which shows a significant rate of fertilizer use is rice and this seems to be related to the government policy of directing supervised credit towards rice production.

Many socio-economic and institutional factors considered earlier together with other technical factors, i.e. mechanization, irrigation and drainage facilities, certainly reduced the potential gains from the "Green Revolution". Despite the spread of HYV's, wheat and barley yields did not increase significantly. In the case of economic returns the introduction of HYV's and chemical fertilizers, it is not possible to evaluate these at present given their low impact measured in production and productivity volumes.

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(31) Hildreth, pp.433-457.

CHAPTER EIGHT

AGRICULTURAL MACHINERY

8.1 Introduction

Many developing countries have been engaged in increasing agricultural production through the introduction of new technologies, especially mechanization, and for many people agricultural progress is summed up in one word - Tractors. [1,2]

Iraq has adopted the same approach. It is considered to be relatively lightly populated with vast areas of potentially cultivatable land, of which only a small fraction is under annual cultivation (see page 121). Agricultural mechanization might, therefore, be expected to be an important factor in the recent and future development of agriculture especially as the labour force may become smaller.

The purpose of this chapter is to review the effect of farm mechanization on agricultural production and productivity in Iraq. First, we consider historical developments, and secondly, the number of farm machinery units sold and distributed. Thirdly, we examine the form of ownership, fourthly, the efficiency of the use of farm machinery and its economic aspects. We than evaluate the impact of farm mechanization on agriculture and finally consider factors affecting farm mechanization in Iraq.

8.2 Historical Review

Higher production and higher productivity can be achieved by expanding cultivation and/or improving farming techniques. In both cases the change-over from human and animal power to mechanical power farming has been one of the most important measures. [3] In the case of Iraq, the use of farm machinery was first introduced after World War I when the demand for agricultural products for export and the local market increased. Many landlords were interested in installing water-pumps, and this helped to expand the cultivated area, especially when cheap labour was no problem. However, the use of mechanical power at the Rustamiya Experimental State farm in 1921 was the starting point of farm mechanization proper, since when agricultural machinery has spread throughout the country.[4]

A major step was taken in 1942 by the Iraqi government to itself import farm machinery so as to establish machinery rental stations for the first time. The first shipment of farm machinery arrived in 1945, but no use was made of such machinery until two years later.[5,6]

The first practical step towards agricultural mechanization was in 1950 when the Agricultural Machinery Administration (AMA) was established as an autonomous agency within the Ministry of Economics.[7] It was responsible for testing and demonstrating new machinery, licensing imports of farm machinery, controlling the supply and distribution of spare parts and finally renting agricultural machinery to farmers.[8,9] This step was taken to encourage farm mechanization through a government agency since, apparently, the private sector was unable to provide machinery or relevant services. However, according to the IBRD mission there were 320 combines and 750 tractors available in Iraq in 1951. Of these only 75 combines and 81 tractors were owned by the AMA.[10] As in many countries, the AMA operated at a substantial loss, and, therefore, its services were withdrawn in 1955.[11,12]

In 1955, the General Directorate of Agricultural Machinery and Implements (GDAMI) was established. The objective of the new directorate was to provide mechanization training with help from the F.A.O. and to provide advisory services. The training centres were closed after three training sessions. [13]

After the land reform law of 1958, the government re-established the AMA in spite of the previous experience of heavy financial losses. The government tried to minimise such losses by transferring ownership of agricultural machinery to the cooperative societies, the latter having borne the cost. [14] Part of the farm machinery stock was acceptable to the cooperatives, such as water-pumps, because they were in good condition, whilst others were rejected. A further attempt was made in 1980 to sell all farm machinery belonging to state establishments to collective farms, cooperatives and individual farmers. [15] The main reason for such action appears to have been the high cost of running farm machinery rental stations in Iraq (as we will see below). Recently, the government has also encouraged private farmers to obtain credit from the Cooperative Bank to buy their own equipment.

In 1959 a factory to assemble agricultural machinery was constructed under the Iraqi-Soviet Technical and Economic Agreement of 1959, and production started in 1970.

8.3 Number of Farm Machinery Units Sold and Distributed

One of the most difficult tasks is to know exactly the number of items of agricultural machinery in working condition available in Iraq, since individual estimates vary tremendously. These variations are caused by many factors: first, there is the difficulty of identifying all types of agricultural machinery, especially in the private sector, and secondly, it is even more difficult to establish whether machines are in working order. One of the latest estimates published in 1977 showed some 15,900 tractors, 3,630 combine harvesters and about 40,500 other farm implements, and these figures are probably higher today. [16]

One indirect method of estimating the number and distribution of agricultural machinery is to examine the import figures, together with the number of units sold and distributed to all types of farming organizations.

In the case of Iraq, agricultural machinery and farm implements are grouped into four types : tractors, combine harvesters, ploughs and other farm implements. Appendix F, Tables F.1, F.2, F.3 and F.4 show the number of agricultural machines sold and distributed in the country between 1950 and 1975 for each category mentioned above. Analysing these tables reveals the following points:-

1. All agricultural machinery had a slow growth in sales between 1950 and 1959 regardless of annual fluctuations (see Table 8.1).

2. There was a sharp decline in the number of agricultural machinery sold in 1959, except for combine harvesters which showed a similar decline in 1960 (see Appendix F, Table F.2 for details). The major factor here was the uncertainty in agriculture after the 1958 Land Reform Law.

3. There was a rapid growth in the number of agricultural machines sold and distributed between 1960 and 1969 regardless of the annual fluctuation during this period. This rapid increase in the sale of agricultural machinery is attributable to the re-establishment of the AMA in 1959 and to a parallel revival in demand by private farmers, cooperatives and state farms (see Table 8.1).

4. The sale of agricultural machinery fluctuated very sharply between 1970 and 1974. The main cause of such fluctuation was import controls during this period as the result of financial stringency following the insecure oil revenues between 1967 and 1972. Nonetheless, the average annual sales were higher than in the previous period, except for

Table 8.1 Number of Farm Machinery Units Sold and Distributed in Iraq

Type	1950 - 58		1959 - 69		1970 - 75	
	Total	Average per year	Total	Average per year	Total	Average per year
Tractors	2,100	233	9,323	848	5,526	921
Combines	1,574	175	2,360	215	513	86
Ploughs	1,473	164	5,745	522	3,187	531
Agricultural Implements	1,580	176	4,967	451	4,294	716

Source : Calculated from Appendix F, Tables F.1, F.2, F.3 and F.4.

combines, which showed a sharp decrease in sales between 1970-75 (see Table 8.1).

Fig. 8.1 shows the annual numbers of agricultural machinery units sold and distributed in the country between 1950 and 1975, clearly showing the decline in sales which occurred in 1959 and the early 1970's.

In short, the low average sales figures for 1950-58 were due to a shortage of capital and other economic and technical factors.[17] In the 1959-69 period there was a rapid growth in sales, the result of increasing demand from private farmers, cooperatives, and the government's agricultural machinery rental stations. During 1970-75, the average sales of farm machinery further increased and this trend seems to be continuing as the result of a sharp decline in agricultural labour force (see page 34).

8.4 The Regional Distribution of Farm Machinery Sold in Iraq

Analysing the numbers of farm machinery sold and distributed by regions reveals the following. First, Table 8.2 shows that 32.3, 54.8 and 12.9 per cent (average over 26 years) of tractors were sold and distributed in the Northern, Central and Southern regions respectively. Secondly, 73.1, 18.2 and 8.7 per cent (26 year average) of combine harvesters were sold and distributed in the Northern, Central and Southern regions respectively. In both cases we can associated these regional differences with the regional characteristics identified in earlier chapters. The Northern area, with its preponderance of rainfed, annual-fallow, cereal cultivation and larger than average farms, has the largest demand for combines and requires fewer but larger tractors than does the Central region. The latter with a greater crop-range, more irrigation, greater production of tree crops and vegetables (partly associated with a larger non-rural regional market), also tends to be better served with capital, machinery maintenance and other services. In the Central region all this forms a natural basis for a relatively low demand for combines,a relatively

FIG. 8.1 AGRICULTURAL MACHINERY UNITS SOLD & DISTRIBUTED, 1950-75

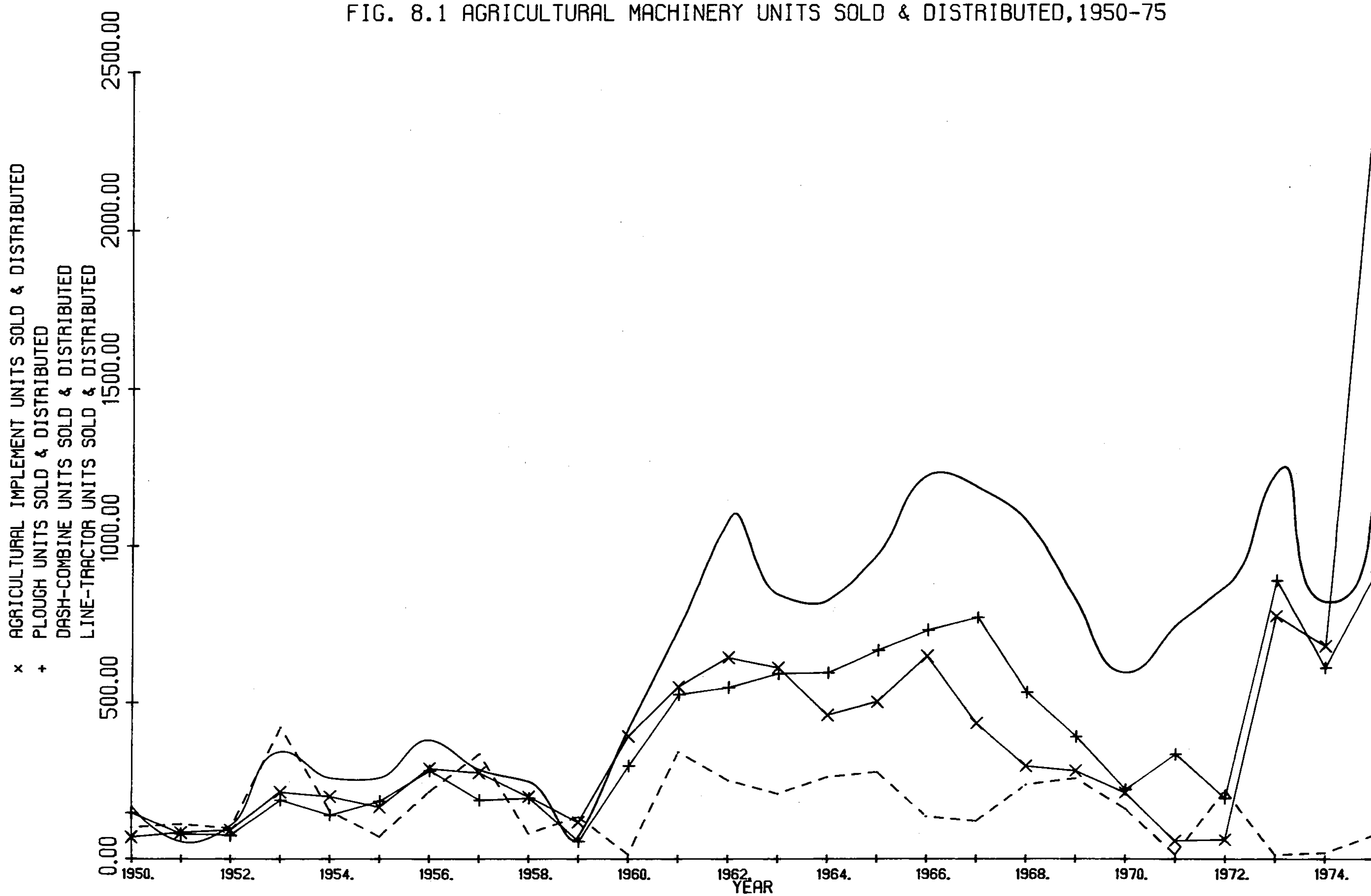

Table 8.2 Number of Agricultural Machinery Units Sold and Distributed by Region

	Tractors			Combined Harvesters			Ploughs			Farm Implements		
	N %	C %	S %	N %	C %	S %	N %	C %	S %	N %	C %	S %
1950	46.1	41.3	12.6	91.8	8.2	-	26.7	57.5	15.8	58.8	39.7	1.5
1951	11.1	61.1	27.8	88.0	12.0	-	20.5	53.9	25.6	23.2	69.5	7.3
1952	49.5	31.4	19.1	88.6	8.3	3.1	33.8	45.9	20.3	52.2	38.9	8.9
1953	44.0	47.2	8.8	87.2	11.9	0.9	28.4	60.4	11.2	59.6	37.6	2.8
1954	55.0	32.2	12.8	80.3	19.1	0.6	19.4	59.7	20.9	62.8	32.7	4.5
1955	28.5	52.7	18.8	60.0	22.9	17.1	16.3	61.4	22.3	29.1	60.6	10.3
1956	40.4	39.9	19.7	57.5	22.4	20.1	31.6	45.4	23.0	44.6	46.4	9.0
1957	36.2	51.9	11.9	84.8	7.5	7.7	21.3	57.4	21.3	38.6	55.6	5.8
1958	18.2	65.6	16.2	32.5	51.3	16.2	6.7	77.9	15.4	15.0	73.4	11.6
1959	27.4	68.5	4.1	89.6	9.7	0.7	17.9	78.6	3.5	30.8	62.4	6.8
1960	25.8	71.8	2.4	80.0	6.7	13.3	19.7	78.6	1.7	18.3	71.3	10.4
1961	27.7	67.6	4.7	87.2	10.8	2.0	16.8	77.5	5.7	32.7	62.6	4.7
1962	53.0	44.4	2.6	96.1	3.9	-	18.7	75.9	5.4	36.2	60.8	2.9
1963	42.9	48.3	8.8	99.5	-	0.5	17.6	69.8	12.6	52.1	41.2	6.7
1964	42.6	43.5	13.9	97.7	1.9	0.4	27.7	58.1	14.2	44.1	46.9	9.0
1965	39.1	44.8	16.1	61.1	35.0	3.9	16.3	61.9	21.8	31.0	60.5	8.5
1966	38.5	45.3	16.2	85.5	8.7	5.8	17.9	61.1	21.0	37.6	54.2	8.2
1967	34.0	48.0	18.0	43.1	10.6	46.3	13.0	65.2	21.8	37.1	54.5	8.4
1968	42.0	47.7	10.3	83.8	10.4	5.8	19.5	63.6	16.9	35.7	57.0	7.3
1969	29.4	59.6	11.0	78.2	20.3	1.5	11.6	73.2	15.2	20.4	78.6	1.0
1970	39.0	49.5	11.5	70.1	22.6	7.3	14.2	73.4	12.4	32.6	63.7	3.7
1971	10.0	77.5	12.5	40.0	-	60.0	5.3	79.1	15.6	3.4	91.5	5.1
1972	16.1	73.4	10.5	70.0	25.1	4.9	10.6	78.8	10.6	1.6	98.4	-
1973	26.1	56.9	17.0	53.8	38.5	7.7	23.1	56.3	20.6	17.9	77.2	4.9
1974	5.0	79.8	15.2	42.1	57.9	-	5.9	75.7	18.4	4.4	89.0	6.6
1975	11.6	74.5	13.9	51.9	48.1	-	11.8	77.9	10.3	15.9	72.3	11.8
Average 26 yr.	32.3	54.8	12.9	73.1	18.2	8.7	18.2	66.0	15.5	32.1	61.4	6.5

N - North C - Centre S - South

Source : Calculated from Appendix F, Tables F.1, F.2, F.3 and F.4.

high demand for medium sized tractors and also for other farm implements, as we can see from Table 8.2. The Southern region stands out as a disproportionately poor market (as measured by numbers of items of machinery) for virtually all types of farm machinery.

8.5 The Form of Ownership

The ownership of agricultural machinery in Iraq can be broadly grouped into private and public sectors. Public sector ownership can be subdivided further into ownership by cooperatives, state farms and that machinery owned by the State General Organization of Agricultural Mechanical Stations (SGOAMS). In this section an attempt will be made to review trends in agricultural machinery according to each form of ownership.

8.5.1 Private Sector

As earlier stated, the spread of farm mechanization in the private sector was very slow, especially before 1958. The only measures taken to increase production were the installation of water-pumps and a greater use of human and animal power to expand the area under cultivation. Table 8.3 shows the distribution of holdings according to the source of power used in cultivation in 1958/59, and clearly shows that 94.2 per cent of holdings used animal and human power only.

This policy had only a limited application since the rapidly growing migration from rural to urban areas made many holders realize the advantages of mechanization and encouraged the private sector large landlords to introduce mechanical power to the fields, especially in the rainfed area, to expand cultivation. (18)

The only source of information on the number of farm machines

Table 8.3 Number of Holdings According to the Source of Power and their Ratio to the Total Number of Holdings in the Province

Province	Mechanical and Animal		Animal only		None	
	No.	%	No.	%	No.	%
Nineveh	3,181	6.0	43,419	81.7	6,519	12.3
Arbil	441	2.5	16,068	91.2	1,117	6.3
Sulaimaniya	65	0.3	10,441	48.0	11,254	51.7
Kirkuk	464	2.7	16,561	95.6	305	1.7
Northern Region	4,151	3.8	86,489	78.7	19,195	17.5
Diala	296	1.6	12,910	70.3	5,172	28.1
Baghdad	2,219	26.2	5,911	69.7	345	4.1
Anbar	865	8.3	7,337	70.6	2,193	21.1
Kerbela	9	0.2	3,911	76.6	1,187	23.2
Babil	492	3.0	13,488	81.2	2,629	15.8
Central Region	3,881	6.6	43,557	73.9	11,526	19.5
Al-Qadisiya	5,966	24.0	13,679	55.0	5,226	21.0
Wasit	309	8.2	2,515	66.4	961	25.4
Thi-Qar	27	0.1	10,409	46.1	12,126	53.8
Maysan	89	0.8	10,902	98.1	125	1.1
Basrah	78	0.4	1,690	7.6	20,325	92.0
Southern Region	6,469	7.7	39,195	46.4	38,763	45.9
Iraq	14,501	5.7	169,241	66.8	69,484	27.4

Source : Ministry of Planning (1961) : Results of the Agricultural and Livestock Census in Iraq for the year 1958/59, Baghdad, Iraq, Table 14, page 12 (in Arabic).

available in the private sector is the series of agricultural censuses. According to the 1952/53 agricultural census there were then 2,191 tractors with a total of 88,016 h.p. used on 1,830 holdings, and there were 42 other powered farm implements in the country, i.e. only 1.5 per cent of the holdings recorded in the 1952/53 agricultural census used mechanical power.(19)

The 1958/59 agricultural census shows that there were 2,402 tractors with 90,230 h.p., 307 combine harvesters with a total of 12,223 h.p. and 199 threshing machines owned by the private sector. Appendix F, Table F.5 shows the distribution of these machines by provinces. Table 8.4 shows that 31.7, 45.1 and 23.2 per cent of all tractors were located in the Northern, Central and Southern regions respectively. This distribution of tractors by regions almost matches the sales distribution (see Table 8.2). As far as the provinces are concerned, it is clear from Table 8.4 that the highest number of tractors was in Baghdad province followed by Kirkuk, Anbar, Al-Qadisiya, Nineveh and Wasit.

In the case of combine harvesters, Table 8.4 shows that 54.7, 22.8 and 22.5 per cent of the combine harvesters in 1958/59 were in the Northern, Central and Southern regions respectively, i.e. half of the combine harvesters were in the Northern region. This is because of the concentration of cereal production there. Also Table 8.4 shows that Kirkuk and Nineveh in the rainfed area had the largest proportions, whilst Baghdad in the irrigated area had the highest proportion of combine harvesters. Large numbers of threshing machines were located in the dry arable production area of Northern Iraq (see Appendix F, Table F.5 for details).

The agricultural census of 1971 shows a significant increase in the number of farm machinery units owned by the private sector. For example, the number of tractors increased from 2,402 in 1958/59 to

8,725 tractors in 1971, i.e. an average annual increase of 22 per cent (see Appendix F, Table F.6 for details). Combine harvesters increased from 307 in 1958/59 to 2,327 in 1971, i.e. an average increase of 55 per cent annually (see Appendix F, Tables F.5 and F.6 for details).

By 1971 the agricultural census reveals that 52.1, 27.6 and 20.3 per cent of tractors were in the North, Central and Southern regions respectively (see Table 8.4). This means that the percentage of tractors to be found in the Northern region increased from 31.7 per cent in 1958/59 to 52.1 per cent in 1971, whilst it decreased from 45.1 per cent in 1958/59 to 27.6 in 1971 in the Central region. The main reason for that is the growth rate of tractors in the Northern region was 15.9 per cent per year, whilst it was only 6.9 per cent per year in the Central region. In fact, the number of tractors in the north increased by at least six times between 1958/59 and 1971, whilst it was only doubled in the Central region. In the Southern region the number of tractors increased by three times.

The distribution of combine harvesters by region in 1971 reveals that 85.2, 5.6 and 9.2 per cent were in the Northern, Central and Southern regions respectively (see Table 8.4). As noted earlier, the main reason for this is the concentration of cereal production in the rainfed area of northern Iraq. As for other farm implements such as ploughs, it seems that a large proportion were in the Northern region, except for water-pumps.

A recent study shows that the private sector owned 20,266 tractors and 1,747 combine harvesters in 1978.[20] According to this study the number of tractors more than doubled between 1971 and 1978, whilst the number of combine harvesters declined.

Table 8.4 The Distribution of Tractors and Combine Harvesters in 1958/59 and 1971 (Private sector)

Province	Tractors		Combines	
	1958/59	1971	1958/59	1971
Nineveh	10.6	26.7	17.9	46.2
Arbil	6.4	5.3	11.1	4.6
Sulaimaniya	1.2	6.9	1.6	6.2
Kirkuk	13.5	13.3	24.1	28.2
Northern Region	31.7	52.1	54.7	85.2
Diala	5.8	8.3	4.9	1.9
Baghdad	20.9	9.7	17.9	3.3
Anbar	11.7	5.5	-	0.3
Kerbela	0.2	0.5	-	-
Babil	6.5	3.5	-	0.1
Central Region	45.1	27.6	22.8	5.6
Al-Qadisiya	10.4	2.9	12.1	3.8
Wasit	9.7	4.7	10.4	3.5
Thi-Qar	0.2	3.8	-	0.9
Maysan	2.7	7.3	-	0.9
Basrah	0.2	1.6	-	0.1
Southern Region	23.2	20.3	22.5	9.2
Iraq	100	100	100	100

Source: Calculated from Appendix F, Tables F.5 and F.6

8.5.2 Public Ownership

8.5.2.a The State General Organization of Agricultural Machine Stations

The agricultural machinery stations were recreated by the Iraqi government after the 1958 land reform as providing the only means through legislation by which the government could mechanize agriculture and provide necessary services to farmers. The land reform beneficiaries, previously sharecroppers, have had neither the experience to farm with mechanical power nor enough capital to buy their own farm machinery. (21) Even in the cooperatives formed according to the land reform law, these problems could not be solved very easily as we will see later. The number of rental stations reached 19 in 1975 but no more recent information is available. Appendix F, Tables F.7, F.8, F.9 and F.10 show the number of tractors, combine harvesters, ploughs and other farm implements owned by the rental stations respectively.

Analysing the number of farm machinery units owned by the SGOAMS reveals the following points: first, the number of tractors continuously increased from 230 in 1960 to 2,033 in 1975, i.e. an annual growth rate of 14.5 per cent. In 1975, there was a particularly large increase in the number of tractors owned by the SGOAMS. Secondly, the number of combine harvesters also increased from 103 in 1961 to 1,334 in 1975, i.e. an annual growth rate of 18.3 per cent; there was also a sharp increase in combine harvesters in 1975. Thirdly, data on other farm implements shows there has been a continuous increase in the number of these implements, especially in 1975.

Analysing the regional distribution of farm machinery owned by SGOAMS, Table 8.5 shows that fewer tractors and ploughs were located in the Northern region than in the Central and Southern regions. This situation is probably due to larger holdings in this region requiring larger and fewer tractors and ploughs. The number of combine harvesters

Table 8.5 The Percentage Distribution of Tractors, Combine Harvesters Agricultural Implements and Ploughs Owned by the Ministry of Agrarian Reform by Region

	Tractors			Combine Harvesters			Agricultural Implements			Ploughs		
	N	C	S	N	C	S	N	C	S	N	C	S
1960	22.2	32.2	45.6									
1961	31.3	33.1	35.6	25.2	20.4	54.4						
1962	29.0	29.7	41.2	42.3	29.2	28.5	45.5	21.8	32.7			
1963	27.6	31.7	40.7	32.0	31.0	37.0	46.9	23.4	29.7			
1964	30.0	29.2	40.8	39.4	27.5	33.1	46.9	23.4	29.7			
1965	24.0	37.7	38.3	31.0	37.3	31.7						
1966	-	-	-	-	-	-						
1967	21.7	45.5	32.8	26.1	41.4	32.5						
1968	21.6	42.7	35.7	25.1	44.8	30.1						
1969	22.4	40.7	36.9	27.3	41.8	30.9						
1970	14.9	37.5	47.6	24.0	45.4	30.6						
1971	21.8	42.2	36.0	22.6	44.2	33.2	21.0	53.4	25.6	19.5	39.3	41.2
1972	31.9	32.1	36.0	35.7	28.8	35.5	32.1	36.2	31.7	26.9	34.6	38.5
1973	33.2	33.0	33.8	37.3	27.6	35.1	29.4	34.1	36.5	28.5	34.0	37.5
1974	29.3	36.4	34.3	37.3	27.6	35.1	35.3	31.4	33.3	26.5	36.7	36.8
1975	32.5	31.4	36.1	35.8	33.8	30.4	39.0	24.6	36.4	23.1	36.2	40.7
	26.2	35.7	38.1	31.5	34.3	34.2	37.0	31.0	32.0	24.9	36.2	38.9

N - North, C - Centre, S - South.

Source : Calculated from Appendix F. Tables F.7, F.8, F9 and F.10.

was almost evenly distributed among regions, whilst the number of other agricultural implements showed a slight increase in the Northern region (see Table 8.5).

Comparing, however, the number of tractors owned by the SGOAMS with those owned by the private sector we see that the private sector in 1978 owned ten times more than SGOAMS owned in 1975. In the case of combine harvesters, the private sector in 1978 owned more combine harvesters than the SGOAMS in 1975, and the same can be said for other farming implements. Apparently, the private sector even now owns more farm machinery than the rental stations.(22) The implication is that the rental station machines have not in fact increased rapidly enough to replace the private sector or to provide satisfactory services to cooperatives in particular who are the main customers, especially if one considers the growth of cooperatives and the agricultural areas under their control during this period (see page 215).

8.5.2.b State Farm Ownership

Using farm machinery in agricultural production was a main concern of management following the establishment of state farms in Iraq and they were pioneers in introducing farm machinery to the country. A complete record on farm machinery owned by the state farms is not available even at the main office. (23) Nonetheless, a study by the Ministry of Agriculture and Agrarian Reform in 1973 reveals some details of the farm machinery owned by eight state farms in Iraq (see Table 8.6). (24) This table shows that Al-Sewarah state farm, the largest in area also,had the largest share of the farm machinery. There is also other farm machinery belonging to agricultural projects, but there is no information on its quantity or type.

Table 8.6 Number of Farm Machinery Units Available at the State Farms in 1973

Items	Abu-Ghraib	Naher Sa'ad	Al-Nay	Latifiya	Al-Mashrua	Al-Sweeb	Al-Hawija	Sewarah	Total
Cars	9	2	6	7	7	5	6	49	91
Combines	4	-	-	3	2	-	3	41	53
Seed Drills	11	10	4	6	5	1	11	71	119
Ploughs	8	-	6	6	5	6	6	43	80
Waterpumps	1	-	8	-	2	8	1	23	43
Landplain	1	-	-	-	-	-	1	3	5
Buldozers	-	-	1	-	-	-	-	2	3
Shovel	-	-	-	-	-	-	-	2	2
Graders	-	-	-	-	-	-	-	4	4
Scrapers	-	-	-	-	-	-	-	3	3
Excavators	1	-	-	-	-	-	-	4	5
Tractors	-	-	9	13	6	7	13	63	111
Jute Machines	-	-	-	-	-	-	-	42	42
Maize planters	-	-	-	-	-	-	-	4	4
Trailers	-	-	-	-	-	-	-	8	8
Cotton cleaners	-	-	-	-	-	-	-	3	3
Canal diggers	-	-	-	-	-	-	-	23	23
Other farm implements	16	-	17	10	9	1	23	84	160

Source : Ministry of Agrarian Reform (1973) ; Report on State farms in Iraq, Baghdad, p.55, (in Arabic)

8.5.2.c Cooperative Ownership

Cooperative ownership of capital equipment is often regarded as most suitable, hypothetically, for a society which lacks financial resources and technical experience. Through this approach farmers can pool their resources to buy their farm machinery and it can provide a more secure basis on which to obtain official and other credit. (25)

Agricultural cooperatives developed rapidly in terms of numbers and area under their control after the 1958 Land Reform Law (see pages 217-20). Maintaining, let alone increasing the cultivated area under the cooperatives control required extra mechanical power, but it seems that the rental stations were unable to cope with increasing demand for farm machinery, especially tractors. Consequently, the government encouraged cooperatives to buy their own farm machinery by providing them with loans at 3 per cent interest rate (see page 220).

Table 8.7 shows the number of tractors owned by cooperatives between 1963 and 1978; Appendix F, Table F.11 shows the number of tractors, combine harvesters and other farm machinery owned by cooperatives. It is clear from these tables that the number of machines has shown a positive trend despite annual fluctuations. This improvement can be seen in Table 8.8 where the ratio of cooperatives per tractor declined from 13.0 in 1963 to 2 in 1975, and it is believed that this ratio has fallen even further. Table 8.8 also shows that the ratio of donums per tractor also dropped from 141,800 donums per tractor (35,450 hectares) in 1963 to 22,300 donums per tractor (5,575 hectares) in 1975. Even so, this positive trend still left cooperatives as inadequately supplied with tractors as with capital (see p.227).

Analysing the regional distribution of agricultural machinery owned by cooperatives, Table 8.9 shows that about 50 per cent of tractors

Table 8.7 Tractors Owned by Cooperatives

Year	No. of Tractors	Year	No. of Tractors
1963	5	1971	81
1964	13	1972	137
1965	49	1973	311
1966	73	1974	387
1967	71	1975	811
1968	6	1976	894
1969	18	1977	833
1970	41	1978	827

Source : Khammo, A.A. (1977) : The Role of Mechanization in the Development of Agriculture in Iraq, Unpublished Ph.D. Thesis, University of Leeds, Table 4.4,p.112.

Ibrahim, S.I. (1979/80) : The Socio-Economic Status for Utilization of Agricultural Mechanization in Iraq, The Arab Planning Institute,Kuwait, Table 9, p.37. (in Arabic)

Appendix F. Table F.11.

Table 8.8 Ratios of Coop/Tractor , and Donums/Tractor in the Cooperative Societies

Year	Ratio Coop/tractors	Ratio Donums/tractor (000)
1963	13.0	141.8
1964	17.3	152.2
1965	6.1	48.7
1966	5.0	35.1
1967	5.8	39.8
1968	78.8	549.5
1969	33.8	200.7
1970	19.2	126.4
1971	10.3	83.5
1972	7.2	72.7
1973	4.1	43.3
1974	3.6	35.2
1975	2.0	22.3

Source : Calculated from Tables 6.3 and 8.7.

Table 8.9 Distribution of Farm Machinery Owned by Cooperatives

Year	Tractors			Combine Harvesters			Other Implements		
	North	Centre	South	North	Centre	South	North	Centre	North
1974	48.8	20.4	30.8	100.0	-	-	37.2	31.9	30.9
1975	49.9	18.1	31.9	100.0	-	-	42.1	20.5	37.4
1976	53.4	19.6	27.0	97.3	2.7	-	55.6	23.5	20.9

Source : Calculated from Appendix F, Table F.11.

and most of the combines, together with a large proportion of other implements were in the Northern region (average over 3 years).

Two major points emerge from the previous discussions: first, private ownership of farm machinery in the mid-1970's dominated all types of ownership in Iraq, and this situation probably still persists. The second largest form of ownership was and is the state, followed by cooperatives. Secondly, a large proportion of agricultural machinery, especially tractors and combines, are located in the rainfed area of northern Iraq. The cultivation of large areas of arable production in this region is more mechanized than any other crop production. [26]

8.6 The Efficient Use of Farm Machinery in Iraq

Probably the most valid way to study the efficient use of farm machinery is by conducting field surveys. Here, however, we shall attempt to deal with the three basic elements - farm machinery utilization, operation cost and rental charges insofar as existing available data allows us.

8.6.1 Farm Machinery Utilization

The demand for farm machinery of any kind has peaks at certain seasonal periods. For example, in Iraq the demand for tractors is at its peak between April and May for ploughing preparatory for summer crops and between September and November for winter crops. The demand for combine harvesters is concentrated between April and June.

Information on the number of operating hours per tractor or combine harvester is very sparse. A.L. Khammo conducted a field survey between 1969-1971 to study different aspects of farm mechanization in Iraq. He found that, in the private sector, the annual operating hours per tractor ranged between 800 and 2,500 hours, and, therefore, the ratio of non-cultivating (transport) to cultivating hours was ranging between 15 - 30 per cent, i.e. the more annual operating hours, the higher the percentage of the non-cultivating hours. [27]

In the case of combine harvesters, he estimated the annual operating hours at 500 hours in the irrigated area (mostly in the Central and Southern regions), and in the rainfed area the annual operating hours was estimated at 900 hours. [28] The difference in the annual utilization between the rainfed and irrigated areas is caused by the small scale of cultivation in the irrigated area, and the great number of irrigation and drainage canals which make combine harvesters rather difficult to manoeuvre, whilst in the rainfed area large fields and the absence of irrigation and drainage canals improve the utilization rate.

In the public sector (SGOAMS), the average annual operating hours per tractor increased from 193 hours per tractor in 1966 to 579 hours in 1974, whilst the annual average per combine harvester increased from 178 hours in 1965 to 550 hours in 1974 (see Table 8.10). Despite the improvement of both tractors and combine harvester utilization in rental stations, their operating hours were very much below the average utilization in the private sector in 1969-1971. This low utilization of farm machinery in the government rental stations may be explained by two points: first, the reported large numbers of idle machines due to scarcity of spare parts, management failure and government bureaucracy. [29] Table 8.11 shows the number of farm machinery idle at the SGOAMS in 1969. The second factor was the considerable travelling distance between farms and rental stations.

As for cooperatives, there is no detailed study available on farm machinery utilization, but an F.A.O. report published in 1971 and other studies confirm that cooperative mechanization was not very successful. [30,31]

Table 8.10 The Annual Average Operational Hours for Tractors and Combine Harvesters in the Public Sector

(SGOAMS)

Year	Tractors	Combine Harvesters
1965		178
1966	193	248
1967	336	245
1968	414	250
1969	363	256
1970	536	254
1971	556	208
1972	702	460
1973	709	340
1974	579*	550*

* estimated figures

Source : Ministry of Agricultural and Agrarian Reform, (1974) : The Agricultural Sector, p. 114.

Table 8.11 The SGOAMS Machinery Utilization During 1969

	Tractors	Combine Harvesters	Bull-dozers
Total No. of Machines	616	545	86
Working Machines	364	458	32
Idle Machines	252	87	54
Total No. working hours	120,695	117,136	13,839
Annual Hours/Total Machines	196	215	161
Annual Hours/Working Machines	332	256	433

Source : Khammo, A.L. (1977) : The Role of Mechanization in the Development of Agriculture in Iraq, Unpublished Ph.D. thesis, Leeds University, Table 4.5, p.114.

8.6.2 Operating Costs

Operating cost is usually divided into fixed (capital) and current costs. The fixed cost is considered to be the cost of the purchase of machines, insurance, housing of machines, depreciation, and interest on capital. In other words, these costs have to be paid regardless of whether the machine is operating or not. The current cost covers maintenance, fuel, labour,etc. Table 8.12 shows the cost of operating a tractor in the private sector in 1969. In this table two groups of tractors are classified according to annual operating hours. Table 8.13 shows the operating cost at the SGOAMS for the same year. Comparing these two tables reveals that the cost of operating per hour in the private sector was almost half of that in the public sector. In the case of combine harvesters, Table 8.14 shows the cost of operating a combine harvester in the private and public sectors. Again, it is clear from this table that operating cost is very low in the private sector.

Although up-to-date operating cost is not available for the cooperative sectors, Khamno cited an F.A.O. study published in 1971 suggesting that cooperatives were losing money on operating their machinery.[32]

8.6.3 Rental Charges

The rental charges in the private sector ranged between I.D.0.75-1.50 per hour for tractors in 1971, this depending on time, area conditions, and the number of tractors available at the area.[33] The rental charges for a combine harvester can be in kind or cash, and the average rental charge was I.D.2.250 per hour,or 10-15 per cent of the harvest in 1971.[34] All these rates must be higher now. Considering the cost of operating tractors or combine harvesters reveals that the private sector was reasonably certain of obtaining a profit from renting farm machinery.

Table 8.12 Estimated Costs of Operating a Tractor and a Plough per Hour in the Private Sector : Two Groups According to the Rate of Annual Utilization in 1969 (I.D.)

	55-65 h.p. wheel tractor				3-Furrow Plough	
	Total Hours Worked	Hours in cultivation	Total Hours Worked	Hours in cultivation		
Details	Gp. I	Gp. I	Gp. II	Gp. II	Gp. I	Gp. II
Purchase Price I.D.	1,200	1,200	1,200	1,200	120	120
Hours per year	900	765	1,750	1,300	765	1,300
Amortization in year	8	8	8	8	8	8
Fixed costs						
Depreciation	0.162	0.191	0.083	0.112	0.019	0.011
Interest on capital at 5 per cent	0.034	0.039	0.017	0.023	0.003	0.002
Housing at 2 per cent on original price	0.026	0.031	0.013	0.018	0.001	0.001
Maintenance at 15 per cent of original price	0.200	0.235	0.102	0.138	0.002	0.001
Variable costs						
Fuel	0.068	0.068	0.068	0.068	-	-
Oil and Lubricants	0.050	0.050	0.050	0.050	-	-
Driver's labour	0.240	0.282	0.171	0.230	-	-
Total fixed and variable costs	0.780	0.896	0.504	0.639	0.025	0.015
Other overheads at 7 per cent of total cost	0.008	0.009	0.005	0.006	-	-
Final total	0.788	0.905	0.509	0.645	0.025	0.015

Source: Khammo, A.L. (1977) : The Role of Mechanization in the Development of Agriculture in Iraq, Unpublished Ph.D. thesis, Leeds University, Table 6.2, p.234.

Table 8.13 Estimated Cost of Operating a Tractor and Plough per Hour in the SGOAMS, 1969 (I.D.)

Item	55-65 h.p. Wheel Tractor	3-Furrow Plough
Details		
Purchase price	1200	120
Total hours per year	392	392
Amortization in years	10	10
Fixed Costs		
Depreciation	0.298	0.030
Interest on capital at 5%	0.076	0.007
Housing at 4% on original price	0.122	0.012
Maintenance at 15% of original price	0.459	0.045
Variable costs		
Fuel	0.068	
Oil and Lubricants	0.050	
Driver's labour	0.382	
Total fixed and variable costs	1.455	0.102
Other overheads at 2 per cent of total costs	0.029	0.002
Final Total	1.484	0.104

Source: Khammo,A.L. (1977) : The Role of Mechanization in the Development of Agriculture in Iraq, Unpublished Ph.D. thesis, Leeds University, Table 6.3, p.236.

Table 8.14 Estimated Costs of Operation Per Hour of Self-Propelled Combine Harvesters in Iraq in 1969 (I.D.)

Items	Public Sector	Private Sector	
		Irrigated Zone	Rainfall Zone
Details			
Purchase Price	2500	2500	2500
Working hours per year	262	500	900
Amortization in year	8	8	8
Fixed cost			
Depreciation	1.192	0.625	0.347
Interest on capital at 5 per cent	0.477	0.250	0.138
Housing as per cent of purchase price 4 per cent public sector and 2 per cent private	0.381	0.100	0.055
Maintenance at 15 per cent of purchase price	1.431	0.750	0.416
Variable cost			
Fuel	0.081	0.081	0.081
Oil and Lubricants	0.075	0.075	0.075
Driver's labour	0.572	0.240	0.133
Total fixed and variable costs	4.209	2.121	1.245
Other overheads as percentage of total cost, 2 per cent public and 1 per cent private	0.084	0.021	0.012
Final Total	4.293	2.142	1.257

Source: Khammo, A.L. (1977) : The Role of Michanization in the Development of Agriculture in Iraq, Unpublished Ph.D. thesis, Leeds University, Table 6.6, p.224.

An individual farm or group of farmers may buy farm machinery to cultivate their land and also to work as a contractor for other farmers. This combination of returns on expenditure has proved attractive,as also found in India. [35]

The rental charges at the SGOAMS was much lower than the private sector, as is shown in Table 8.15. For example, the rental charge per wheeled tractor was I.D. 4 per 8 hour day, or I.D. 0.5 per hour. Considering the operating cost of major types of farm machinery with the rental charges reveals that rental stations were operating at a loss, or in other words, the government was subsidising the cost of farming operations, especially in cooperatives.

Data on the operating cost of farm machinery at the state farms is not available, but evidence on production cost probably suggests that operating cost was and is higher than in the private sector, or at least the same as in the rental stations (see Tables 6.13, 6.14 and 6.15).

It may be concluded from this discussion that the private sector appears more efficient in utilizing farm machinery than is the public sector as a whole, the main reasons being the high fixed and current costs and low returns and operating hours for public sector machinery. [36] This seems to be supported by the government's recent decision to sell all agricultural equipment to individual farmers, cooperative and collective farms.

8.7 The Impact of Farm Mechanization on Agriculture in Iraq

Farm mechanization in general may have two major impacts : social and economic. [37] The social factor is that mechanization may reduce working hours and increase time for leisure. The economic impacts are our main concern here. Farm mechanization can improve land and labour productivity and may release part of the labour force to other economic

Table 8.15 Rental Charges of the SGOAMS in 1971

Type of Machine	Dinars per 8 hour day
Track layer tractor	5
Wheel type tractor	4
Combine Harvester	14
Seed cleaner	3.25
Bulldozer	12
Excavator	20
Mould board plough	1
Disc plough	1
Disc harrow	1
Cultivator	1
Land leveller	3
Ridger	1
Seed drill	1
Farm trailer	1
Ditcher	2
Potato digger	1

Source: Khammo, A.L. (1977) : The Role of Mechanization in the Development of Agriculture in Iraq, Unpublished Ph.D. thesis, Leeds University, Tables 8.2 & 8.3, p.291.

sectors (assuming such a labour demand exists). In agriculture itself, mechanization hypothetically means labour intensifying through multi-cropping and improved field operation.[38] Hence a careful planning of agricultural mechanization is required by considering many aspects, such as the rate of labour force growth, rural-urban migration, the expansion of other economic sectors and the availability of land and water for cultivation.

Agricultural mechanization can also improve land productivity through improvement of water control, better soil preparation, plant protection, harvesting, handling, drying and storage. Theoretically, good timing of all these operations enhances yields of individual crops and maximizes the efficient use of each unit of cultivated land throughout the growing season. Here the role of farm mechanization in developing countries, including Iraq, is very important where HYV's of wheat and rice have been introduced. These high yielding varieties will respond more if all the farming operation requirements are met accurately.[39]

The impact of mechanization on improving land productivity can be measured by comparing yields of crops on traditional and power mechanized farms.[40] Studies have been carried out in different countries, and this seems to become more important since the price of energy has increased tremendously since 1973. In Canada, for example, a study reveals that mechanization has not reduced the per acre yield even though it has encouraged more extensive farming. The available evidence would seem to indicate that per acre yield has actually increased over the past twenty-five years. Better types of crops, insecticides, herbicides and other factors are partly responsible, but more timely field operations and better kinds of cultivation with new machines are also partly responsible.[41] Other studies cited by Singh reveal that agricultural mechanization may improve land productivity, but the level of productivity varies according to several technical and environmental factors in combination.[42] Here, one may assume that using farm machinery as a single input factor will have a limited effect on improving land productivity, but on the other hand it will help to expand the cultivated area by making cultivation easier and faster.

Giles developed the theory of a minimum requirement of h.p. per hectare in order to achieve a significant yield increase.[43] This theory seems to be based on a comparison between the h.p. per hectare in developed and developing countries. This theory suggests that a minimum of 0.5 h.p. per hectare is required to achieve a significant change in yield. The application of this theory should be approached very cautiously, especially when other factors are considered, i.e. the use of other input factors, soil and environment conditions.

In Iraq, there are no detailed studies on the impact of farm mechanization on agriculture, and we therefore have to rely on the analysis of data earlier presented. First, yields of principal crops, namely, wheat and barley did not significantly increase during the past twenty-five years despite the increase in the number of farm machinery units in the country (see Table 6.9). This might suggest that farm machinery was used mainly for basic farm operations, such as ploughing and harvesting, whilst other farming operations were neglected.[44,45] Secondly, we can tentatively apply the minimum h.p theory. If we take the assumed elements in the ratio as being the total number of tractors and combine harvesters available in the country in 1978 and that half of the reported area in the 1971 agricultural census is cultivated annually (see Appendix B, Table B.2), we find that the average h.p. per hectare is 0.4, which is below the minimum level required by Giles to produce a yield increase. In the end we have to rely on a more general evaluation of the problems affecting farm machinery use in Iraq. It is clear from the foregoing that farm mechanization has increased in number of units but increasing productivity of the principal crops was not significant, except for rice (see Table 6.9). We must, therefore, assume that there were and are problems associated with farm mechanization in Iraq.

First, the economic problem may be considered for two periods: pre-and post-land reform of 1958. In the pre-land reform period, the lack of land tenure security, poor landlord-tenant relations, etc. prevented investment in farm mechanization to any large extent. Large landlords were not interested in mechanizing agriculture given the cheap labour force, whilst small farmers were faced with capital shortages. The prices received by farmers for their products were also low in relation to investment required for mechanization.

In the post-land reform period, the agricultural policy emphasized the role of the cooperatives and the public sectors in providing farm mechanization. Cooperatives, however, still face many problems, i.e. shortages of capital to enable them to buy their own farm machinery (see page 227), and even when they own their farm machinery, they face technical problems of maintenance, etc. Meanwhile, rental stations were established throughout the country, but their services were and still seem inadequate. The main reasons for this are managerial and technical factors which led to high cost and low performance. As a result, the private ownership of farm machinery still dominates all other forms of ownership and provides most of the farm machinery services.

The low level of education and the absence of efficient extension services make farmers unaware of the advantage of effective mechanization (see page 246). Traditional farm operations are still very common, and tractors were/are used only for ploughing, whilst other farm operations, if any, are being done by hand.

Technical factors have clearly resulted in the low performance of farm machinery. Substandard maintenance causes widely reported breakdowns in machines and the scarcity of spare parts keeps farm machinery idle for long periods, especially at the state farms and rental stations.[46]

High summer temperatures with maxima reaching 50^{o}C, and large temperature ranges together with frequent dust storms, natural and induced by operations, produce very heavy wear on all moving parts. Batteries have a shortened life. Soils in general become mechanically very hard when dry and heavy to work when irrigated. The small size of plots, especially in the irrigated areas, make machinery difficult to handle. As elsewhere in harsh environments, under Iraqi conditions extra skill and care is needed in the use and maintenance of farm machinery and this is as difficult to produce as any good husbandry practice.

8.8 Conclusion and Final Remarks

Experience in many countries has proved that farm mechanization can play a vital role in improving agricultural productivity and increasing agricultural production. An attempt was made in this chapter to study farm mechanization in Iraq as a new input factor. Apparently, the spread of farm mechanization was slow before the 1958 land reform law. Shortage of capital, insecure land tenure system, low prices of agricultural products and insufficient extension services prevented small farmers from investing in mechanization. Large landlords, on the other hand, were not interested in mechanization because of the cheap labour force. In the post-land reform period the spread of farm mechanization was faster as a result of the increasing demand from the private sector, state farms, cooperatives and the spread of the rental stations. Nonetheless, evidence suggests that private ownership remains very important in providing mechanical services to agriculture, this followed by the rental stations and cooperatives respectively.

The regional distribution of farm machinery shows that a large proportion was in the Northern region, especially combine harvesters. This is due to the existing large dry arable farming there. In the Central and Southern regions, tractors are the most common type of farm machinery.

Apparently farm mechanization in the private sector has been more productively effective than on the rental stations and probably cooperatives and state farms. Operating cost is very high in the rental stations compared with the private sector. Poor management and performance are the main reasons for this. Nonetheless, the rental charges at the rental station are lower than the private sector. This means that the government is subsidizing the rental station, whilst the private sector makes a profit.

The impact of farm mechanization on increasing productivity is very limited. Yields of the principal crops have not increased significantly. This and other evidence earlier presented suggests that other input factors are not well developed, i.e. HYV's, fertilizers and plant protection. Here there is a very strong inter-relation between these factors and mechanization and vice-versa.

Many factors have affected agricultural mechanization in Iraq, economic, social, technical and environmental, and all these factors must be considered very carefully if a successful farm mechanization policy is to be developed.

What is the future of farm mechanization in Iraq? It seems most likely that farm mechanization will spread even faster because of the continuous decline in the agricultural labour force and the vast area of cultivated land. Nonetheless, this will largely depend on the availability of water for irrigation and this latter point will be discussed in the following chapter. In terms of this thesis, we can also conclude that with agricultural machinery, as with the other input factors affecting agricultural production and productivity, all the available evidence suggests that technical innovation in itself is not enough. What matters is the effective application.

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CHAPTER NINE

WATER RESOURCES AND IRRIGATION METHODS

9.1 Introduction

Water is, and always has been essential to life and played an important role in the development of the civilizations which developed on riverine lands, such as those of the Euphrates and Nile in the Middle East.[1,2] Today, water is of paramount importance among the principal factors which help to improve agricultural productivity. For example, the potential yield response of HYV's to fertilizers can only be obtained by the application of adequate water at the right time, and the avoidance of excess watering.[3,4]

Earlier, the potentially cultivable land of Iraq was classified into rainfed and irrigated areas (see pages 109-22).In the rainfed area, given the limited annual and seasonal precipitation, the farming system should be oriented towards making the most effective use of available moisture. In the irrigated area, however, the supply of water is man-controlled and must be rationed between various crop uses to make the optimum use of it, the ultimate aim being to maximise desired production and income.[5]

The major source of irrigation water in Iraq is surface water supplied by the twin rivers' systems, the Tigris and Euphrates. Underground water is not fully exploited yet, especially for irrigation purposes.[6,7] No comprehensive geo-hydrological survey of groundwater has been carried out but there are some individual studies of a few areas. Nonetheless, there were 1,864 operating wells reported in the country in 1973.[8]

This chapter covers the main following points : the hydrology of the two rivers, irrigation methods, problems of the irrigated area, and future expansion of the cultivable irrigatable area.

9.2 The Hydrology of The Rivers

9.2.1 The Tigris

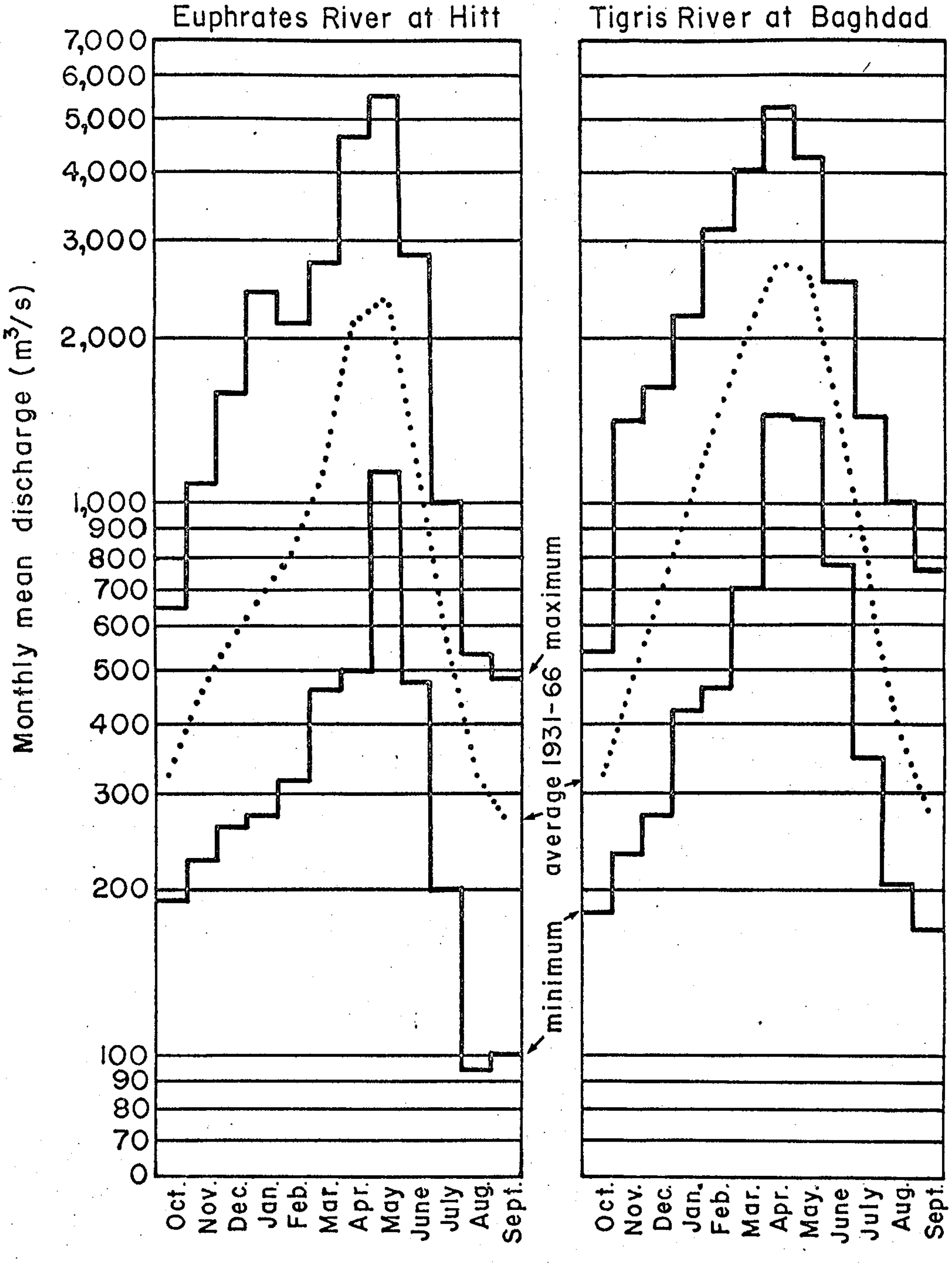
The Tigris originates in Turkey and enters the country from the north-west near the Iraqi, Syrian and Turkish border. Hence, Iraq is a riparian state, but does not control the flow of the river. The length of the Tigris is 1,718 km. from its source to Shatt Al-Arab, of which 1.418 km. lie in the Iraqi territories. The total area of its basin is 166,155 sq. km. The Tigris in Iraq has five main tributaries identified in Table 9.1, all of which except the Audiam rise in Turkey and Iran.

The average annual discharge of the Tigris at Baghdad between 1960 and 1976 was 32.5 milliard cubic metres/year, and it can be divided into three periods; the flood period from February to June, the summer low-flow period from July to October and the period of winter rainfall flood from November to January.(9) Fig. 9.1 shows the average monthly discharge of the Tigris river for the period between 1931-1966. About 75 per cent of the Tigris annual flow occurs during the flood period, during the low flood period about 10 per cent and during the autumn and winter rainfall flood about 15 per cent. The greatest water discharges during the flood season occur in April and May, and the minimum water discharges are observed in September and October.

9.2.2 Euphrates River

This is the second largest river in Iraq. It rises in Turkey and flows southward towards Syria and enters Iraq at the North-western border. The case of the Euphrates is even more complex than the Tigris since Iraq is not only a riparian state without control of the river headwaters but also has to share its waters with Turkey and Syria. The

Fig. 9·1 The Average Monthly Discharge of the Rivers Tigris and Euphrates



Source: UNESCO(1976): Iraq: Contributions on Natural Resources Research, Paris, pp.115-116

Table 9.1 The Tigris's Main Tributaries in Iraq

Name of River	Total Length Km.	Length within Iraq territories Km.	Total Basin sq. km.
Khabour	*	160	6,000
Greater Zab	392	150	26,473
Lesser Zab	400	250	22,250
Audiam	230	230	1,300
Diala	386	300	*

* No information available

Source : Saman, B.B. (1973) : Some Light on Some Important Aspects of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq, part one, pp.63, (in Arabic).

length of the river is 2,300 km. of which 1,213 km. is within the Iraqi territories. The Euphrates has no tributaries in Iraq except for many small spates flowing from the desert during the rainy season.(10) In Syria, the Euphrates has several tributaries, the most important being the Khabour. The total area of the river basin is 264,120 sq.km.

The average annual flow between 1960 and 1976 at Hitt was 30.5 milliard cubic metres/year. The annual cycle of the river discharge can be divided into three periods: the flood period (March - July), the summer low-water period (August - October), and the period of rain (November - February). About 70 per cent of the Euphrates river annual discharge runoff passes during the flood period, about 10 per cent during the low-water period and about 20 per cent during the period of winter.(11) The highest level of water discharges are observed in April and May. The lowest level of discharges are in September - October (see Fig.9.1).

9.2.3 Shatt Al-Arab This name is given to the river formed by the joining of the Euphrates and Tigris rivers at Kurmat-Ali near Basrah. The length of the river is 110 km. It has only one tributary - the Karun which rises in the Iranian territories. Shatt Al-Arab is a tidal river and this phenomenon is very important in affecting the irrigation of large palm-tree orchards on both sides of this river.

9.3 The Characteristics of the Rivers Tigris and Euphrates

It is clear from the previous discussion that the seasonal distribution of water discharge of the two rivers does not coincide with crop need periodicity. The flood period is very early for the summer crops and late for winter crops.(12) Therefore, the low flow level during the summer season has limited the cultivation of summer crops in the irrigated areas of the Central and Southern regions. Here, the Tigris and Euphrates are unlike the Nile river which floods when water is needed in summer.

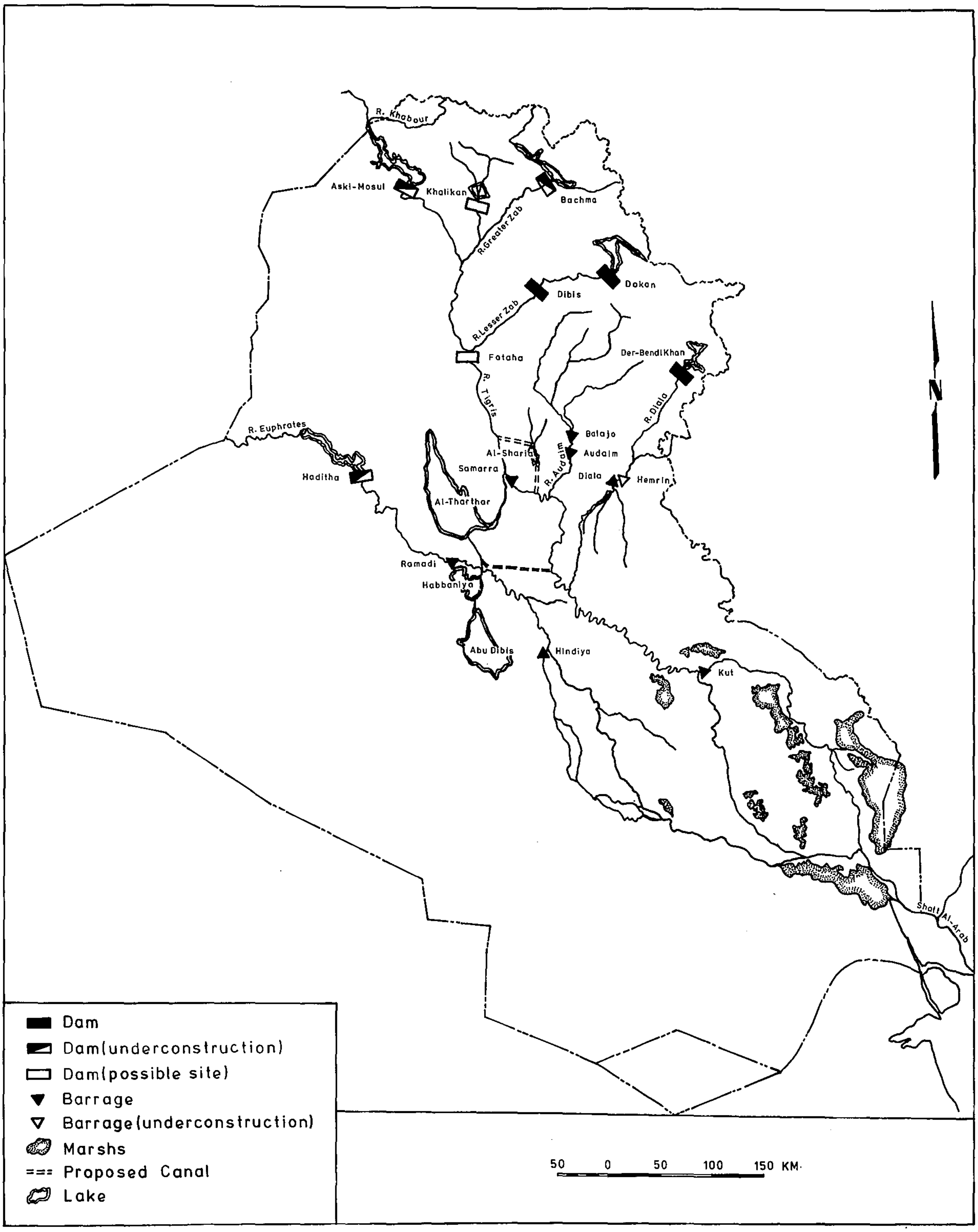
Even more than in the case of the Nile, the Euphrates and Tigris rivers carry a large amount of silt, especially during the flood season. The sediment load ranges from 1000 g/l. to 4,000 g/l., varying with the flow, time of the year, flooding period and several other factors, and considerably affects irrigation systems.(13,14) For example, in the Greater Mussayib Irrigation Project, the water discharge in the main canal was reduced within a year of commissioning from 40m/sec to 32 m/sec when the bed level in the head rose by 1.8 m.(15) Nonetheless, this problem becomes less serious with more integrated river control through dams, barrages, reservoirs and vegetation conservation.

The quality of water is very good for irrigation.(16) It is estimated that the water in the two rivers contains 0.2 - 0.4 g./l of salts, an EC value ranging from 0.84 to 1.30 mmhos/cm throughout the year.(17,18) Although the salt content in both rivers is relatively low, intensive irrigation raises the soil water table and salt is transported with water through capillary action and evaporation to the surface, as a result of which process residual salinity becomes actual salinity.(19)

9.4 Water Control Projects in Iraq

Water control projects are essential to control the flow of both rivers for irrigation and other purposes. The government has given top priority to water control projects, especially during the period of the Development Board (1950-58). During this period a large proportion of agricultural investment went to such projects (see page 47) which then as now are mainly of two types - storage projects plus control (generally dam schemes), and water distribution by barrages. Fig. 9.2 shows the location of existing projects in Iraq.

Fig. 9.2 WATER CONTROL PROJECTS IN IRAQ IN 1978



Most storage-reservoirs have at least one or more of the following purposes : water storage, flood control and generating electricity. Table 9.2 collates brief details of the number of such schemes. Most of these projects were chiefly designed to control floods in order to protect the Central and Southern regions. One of the most important storage reservoirs in this respect is Al-Tharthar with a capacity of 85 milliard m^3 of water, and 58 milliard m^3 of water as live storage. Al-Tharthar was also developed as an irrigation project through a canal with a capacity discharge of 500 m^3/sec. linking Al-Tharthar with the Euphrates.

As for other projects, Al-Habbaniya Lake, Dokan and Der-Bendi Khan are used for flood control and irrigation, and the last two reservoirs are under development to generate electricity. Abu-Dibis depression is an open lake which takes its water from Al-Habbaniya Lake during periods of extremely high floods. Fig. 9.2 shows the location of these dams.

Besides the existing projects there are others planned or under construction projects as shown in Table 9.3 and Fig. 9.2, and other possible sites also exist.[20] The total storage capacity of the existing dams is 124 milliard m^3., and when the under-construction projects are completed, the total water storage capacity will be 150.8 milliard cubic metres.

It seems that existing and under-construction dams will be able to control floods in Iraq, given the increased abstraction of river water in Turkey and Syria. However, this same abstraction poses the question whether these dams will be able to provide enough water for cultivation throughout the year to allow intensive irrigated cultivation in the future. The answer depends upon many factors, e.g. the extension of the cultivated area, choice of crops, farming, water and soil management (including environmental control) and at this stage it is rather difficult to arrive at any firm conclusion.

Table 9.2 Water Reservoirs in Iraq

Name of the Reservoir	Location	Total storage Milliard m^3	Live storage Milliard m^3	Date of Construction
Habbaniya lake	Euphrates	3.7		1956
Abu-Dibis Depression	"	25.5		
Dokan	Lesser Zab	6.8	6.1	1959
Der-bendi Khan	Diala	3.0	2.5	1963
Al-Thar-Thar	Tigris	85.0	58.8	1956

Source Saman,B.B. (1973) : Some Light on Some Important Aspects of Iraqi Agriculture, Ministry of Planning, Baghdad, Iraq, page 61, (in Arabic).

Table 9.3 Planned Water Reservoirs in Iraq

Name of the Reservoir	Location	Total storage Milliard m^3	Live storage Milliard m^3	Stage of Development
Aski-Mosul	Tigris	12.5		Under-Construction
Bakhma	Greater Zap	8.3	7.8	"
Hemrin	Diala	2.5	2.14	"
Haditha	Euphrates	3.5		"

Source Meed (1979) : Arab Report, No.7, 25th April, page 22.

9.5 Irrigation Methods

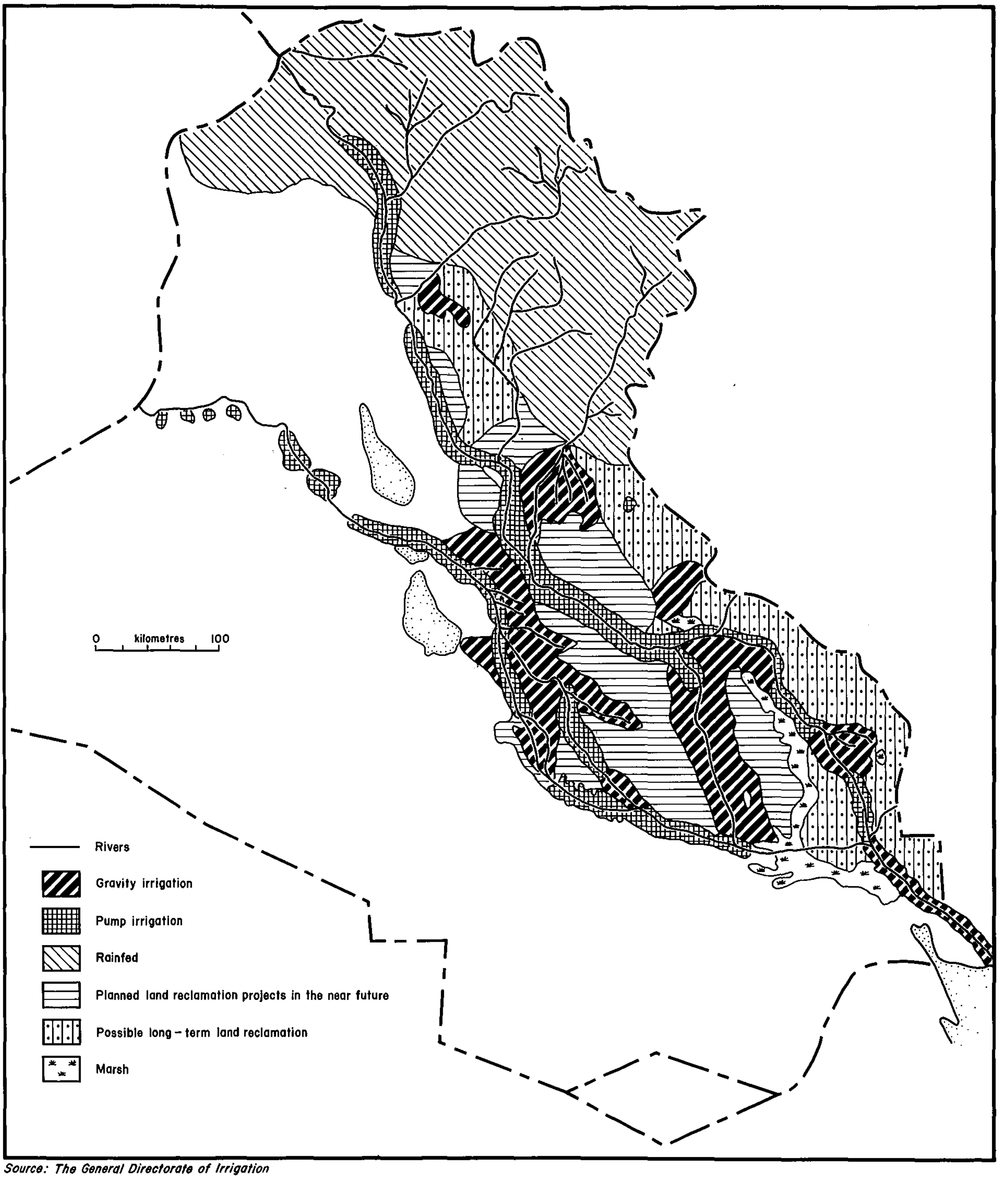
The only available data on irrigation methods come from the 1952/53 and 1958/59 agricultural censuses, which classify them as flow (gravity) irrigation, pump irrigation and, lastly, other traditional methods. Appendix G, Table G.1 shows the distribution of irrigation methods by province in 1958/59. Fig. 9.3 shows the location of irrigation methods in Iraq. However, it seems from this official map that pump irrigation is practised along the Northern part of the river Tigris, although there is no clear evidence to suggest such a large scale practice.

9.5.1 Flow (Gravity) Irrigation This is the cheapest, oldest, simplest and the most common irrigation method in Iraq. Table 9.4 shows that 57.9 and 58.9 per cent of the total irrigable area was irrigated by this method in 1952/53 and 1958/59 respectively.

Table 9.5 shows that 12.91, 40.31 and 46.78 per cent of the gravity systems were in the Northern, Central and Southern regions respectively in 1958/59. For provincial distribution of gravity irrigation, Table 9.5 shows that Thi-Qar, Diala and Babil had the largest area under gravity irrigation. The main reason for this concentration is the suitability of topography. For example, the bed of the River Euphrates is higher than the surrounding land in the Middle-Euphrates region below Habbaniya barrage and Diwaniya. Several barrages have also been built on the Euphrates, Tigris and Diala rivers, e.g. Dibbis, Hinidiya, Kut and a weir dam on Diala river, to control water flow and raise the level of water in the main rivers for diversion via canal to the irrigated areas.(21) Most new projects and those being constructed are based on gravity irrigation methods.(22)

9.5.2 Pump Irrigation The importance of water-pump irrigation increased after the first world war, and the number of water pumps has increased, especially in the Central and Southern regions. Appendix G, Table G.2 shows the distribution of installed water pumps by province between 1950 and 1975 when the total number increased at an annual rate

Fig 9·3 IRRIGATION METHODS IN IRAQ



Source: The General Directorate of Irrigation of 6.9 per cent between 1949/50 and 1974/75. It appears from Appendix G, Table G.2 that the number of pumps installed in the Northern region started to increase rapidly later, from 1963/64 onwards. The regional distribution of installed water-pumps was 17.2, 42.8, 40.0 per cent in the Northern, Central and Southern regions respectively. The types of ownership of these pumps are the same as found for farm machinery (see page 302).

According to the 1963 government official figures there were then 2.56 million donums under pump irrigation, nearly 18.9 per cent of the total irrigated area. However, 1952/53 and 1958/59 agricultural census data recorded 4.5 and 5.8 million respectively under pump irrigation, much higher than the 1963 government figures (see Table 9.4). The reason for such discrepancy may be the overlap between pump irrigation and gravity irrigation, where pumps are used for supplementing gravity irrigation. If we take the higher figures then, as Table 9.4 shows, 38.4 and 39.4 per cent of the irrigated land was under pump irrigation in 1952/53 and 1958/59 respectively.

Table 9.5, derived from the 1958/59 data shows that 0.78, 29.89 and 69.33 per cent of the irrigated area under pump irrigation was in the Northern, Central and Southern region respectively.

9.5.3 Other Irrigation Methods This group includes the tidal irrigation in the palm-tree orchards in Basrah province and lift irrigation by traditional methods, e.g. Persian wheels, water wheel, common in the Central and Southern regions. Flood irrigation is also practiced in the rice growing areas in the Southern region. In this method, water is held by a temporary obstruction after flooding and rice is cultivated in the flooded area. In the Northern region a small area is irrigated by karez (underground gallery). Table 9.4 shows that 3.7 and 1.7 per cent of the irrigated area was under this means of

Table 9.4 Irrigation Methods According to The Agricultural Censuses of 1952/53 and 1958/59

Irrigation Methods	1952/53 (Donums)	%	1958/59 (Donums	%
Gravity Irrigation	6,740,944	57.9	8,662,040	58.9
Pump irrigation	4,478,106	38.4	5,795,367	39.4
Others	430,101	3.7	242,882	1.7
Total irrigated area	11,649,151	100	14,700,291	100

Sources : Ministry of Economics (1954) : Report on the Agricultural and Livestock Census, Baghdad, Iraq, Table 6, page 12, (in Arabic)

Ministry of Planning (1961) : Results of the Agricultural and Livestock Census in Iraq for the Year 1958/59, Baghdad, Iraq, Table 6, p.9, (in Arabic)

Table 9.5 Distribution of Irrigation Methods in 1958/59

Province	Rainfed %	Gravity %	Pumps %	Others %
Nineveh	44.51	1.05	0.71	3.07
Arbil	14.90	1.04	0.04	0.26
Sulaimaniya	6.21	4.85	0.01	0.40
Kirkuk	19.23	5.97	0.02	0.08
Northern Region	84.85	12.91	0.78	3.81
Diala	8.17	17.94	1.60	11.25
Baghdad	3.27	4.92	22.11	1.17
Anbar	0.25	1.22	4.82	13.53
Kerbela	0.20	1.56	0.18	3.60
Babil	0.04	14.66	1.18	21.28
Central Region	11.93	40.31	29.89	50.83
Al-Qadisiya	0.08	9.93	22.30	20.57
Wasit	0.32	7.85	28.99	1.04
Thi-Qar	0.25	19.03	5.91	18.54
Maysan	2.54	7.20	10.85	2.15
Basrah	0.03	2.77	1.28	3.06
Southern Region	3.22	46.78	69.33	45.36
Iraq	100	100	100	100

Source : Calculated from Appendix G, G.1.

irrigation, which is not very significant, and probably declining. Table 9.5 shows the concentration of these methods in the Central and Southern regions.

9.6 Problems of the Irrigated Area

The irrigated area is facing even more serious problems than the sedimentation noted earlier. These problems are water logging and salinization, and they have damaging effects on land productivity, especially in the Central and Southern regions of Iraq.

9.6.1 Water Logging Generally speaking, in most of the Central and Southern regions the groundwater is both near the surface and salty, this a result both of human action and physical environmental conditions.[23] In particular, a result of high evaporation rates and irrigation, salts-charged water rises to the surface and salts accumulate in the topsoil as a result of evaporation.

In general, in Iraq most irrigation water from the main river systems is of good quality although there are areas where saline groundwater is found. However, unless utilised irrigation water, charged with solubles, is drained away the water table may rise progressively as surplus soil water reduces soil permeability. This in turn produces a higher concentration of salts-charged water in the raised water table. The water table level itself depends on the physical characteristics of soils, wind, temperature, evaporation and other factors. Here, the capillary characteristics and permeability of the soils are important in determining the water-table, its fluctuations over time and the required depth of drainage systems if deterioration of the soil-water complex is to be avoided.

The effect of water logging on land productivity is shown in

Table 9.6. It is clear from this table that barley productivity improved as the depth of the ground water increased from 0.5 metres to 1.6 metres.

Farmers traditionally used the fallow system to avoid waterlogging since during a fallow period of sufficient length (usually one year), the soil profile will dry out to the point at which upward movement of moisture becomes negligible. Here, the object of the fallow system is not to restore soil moisture. Nonetheless, recent studies show that a simple fallow system may in fact cause localized high concentration salts due to the localised absence of leaching.[24] Furthermore, during the fallow period several types of deep rooted plants, such as Shok (Prosopis stephamiana) and Agul or camelhorn (Alaqi maurerum) grow, and this will help to reduce the ground water table as well.[25] The only satisfactory solution is to develop active drainage systems as we will see later.

9.6.2 Soil Salinity Most of the ancient civilizations in the Mesopotamian plain valley were dependent on agriculture. In the early period salinization was slow to develop and yields were relatively high. In recent years, Iraq has faced a very serious soil salinity problem. In general, soil salinity gradually has increased from the north to the south and land capability for agricultural production declined in the same direction.[26] It has been stated that most of the land in the Central and Southern regions has been affected by different levels of salinization, and it has been estimated that 20-30 per cent of the cultivable land in the irrigated area has been abandoned during recent decades owing to the accumulation of salts and a decline in yields of between 20-50 per cent.[27,28] Buringh has stated that nearly all soils in the lower Mesopotamian plain are saline and a large area strongly saline. Babil province is probably the most saline district in the

Table 9.6 Barley Yields in Relation to Water Table

Ground water depth m.	Barley yield[1] Kg/donum	Ground water depth m.	Barley yield[2] Kg/donum
0.5	150	0.50	162
0.7	250	0.65	238
1.0	400	1.00	388
1.4	450	1.10	328
1.6	700	1.48	437
		1.56	714

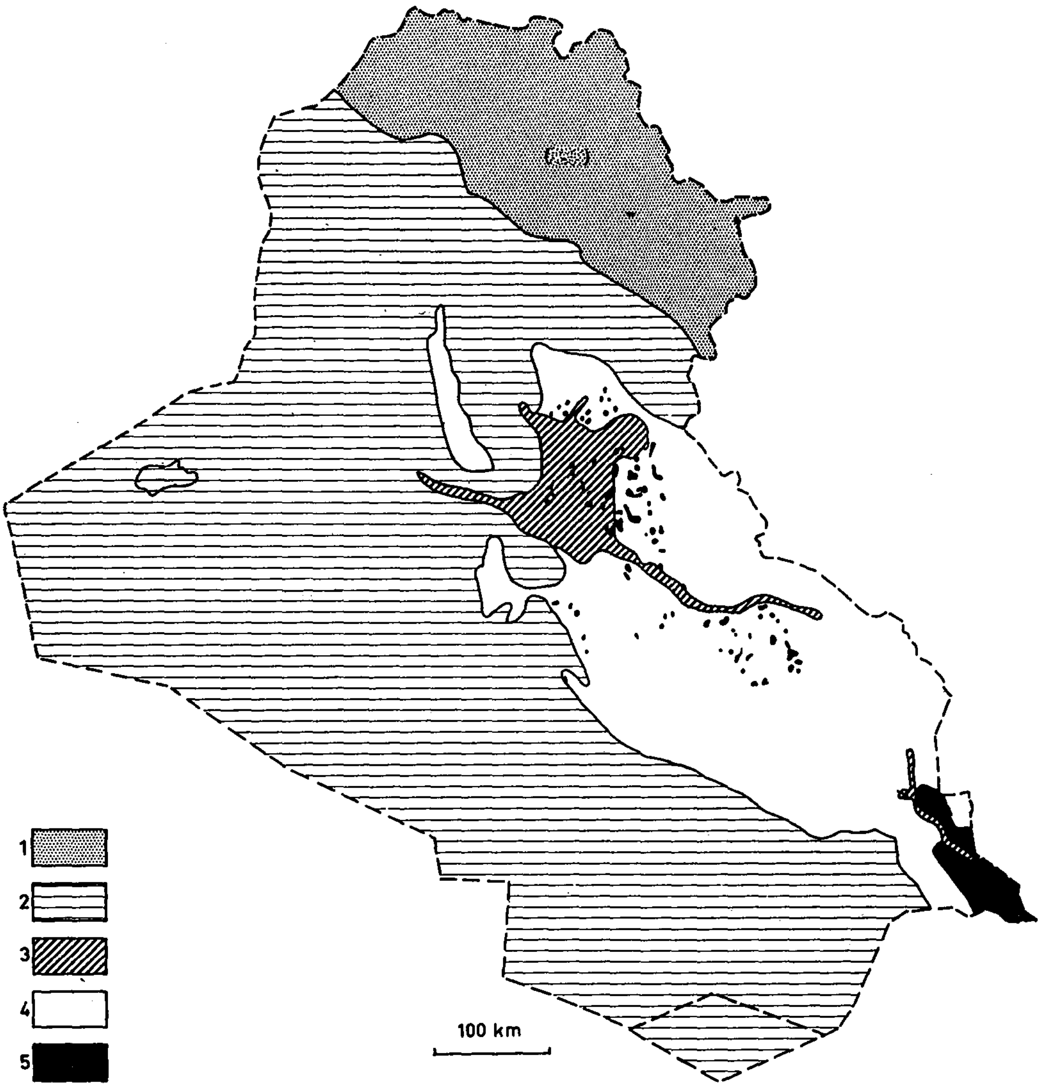
Sources :
1. Ministry of Irrigation & Sel Khozpromexport (USSR) (1975) : General Scheme of Water Resources and Land Development in Iraq, Baghdad, Iraq, Table IV : 2.2.6, p.129
2. Dieleman, P.J. (ed.) (1963) : Reclamation of Salt Affected Soils in Iraq, H.Veenman & Zonen N.V., Wageningen, The Netherlands, Table 18, p.59.

country. Non-saline soils occur mainly in the rainfed zone of northern Iraq where rainfall is sufficient for growing many crops without irrigation and for some natural leaching. In this region only a few depressions without drainage have saline soils.[(29)] Fig. 9.4 shows land salinity at different levels of salinization. Table 9.7 shows the classification of irrigated land by salinity in 1972. The main factors which cause salt accumulation in soil are as follows:-

1. Excessive use of water for irrigation. Iraqi farmers believe that the more water is used for irrigation, the higher yield they will obtain. In other words, farmers use more water than is actually required or consumed by the plants. For example, cotton growers usually irrigate their farms between 20-25 times during the growing season. A field experiment, however, shows that irrigating cotton 15 times with similar application rates was quite sufficient to obtain high yields.[(30)] This means a large amount of water can be saved by better water management. It has been estimated that nearly 40,000 million cubic metres of water were wasted annually through irrigation, including 4 million cubic metres for justified waste which cannot be saved, such as evaporation, seepage, etc.[(31)] This wastage may be saved by introducing irrigation dues, improving irrigation systems, viz. modernization of irrigation canals, more water control, better farming systems and good extension services. These measures are necessary in the future when water becomes less available from the upper waters of both rivers, especially the Euphrates, and demand for water from other sectors further increases.

2. Excessive water duty is particularly dangerous, especially if there is a lack of land drainage. In Iraq, as in many other developing countries, only the major distribution systems of irrigation and drainage are installed in projects, leaving on-farm development of water

Fig 9.4 SCHEMATIC MAP OF SALINIZATION IN SOILS OF IRAQ



1. soils without salinization; 2. deserts and soils with some salinization locally; 3. soils with moderate salinization; 4. soils with severe salinization; 5. (and black dots) soils with salinization and solonization. (9.9)-area in 1000 km.[2]. Solonization processes have only been noticed in some small areas on Tigris terraces east of Samarra.

Source: Buringh, P. (1960): Soils and Soil Conditions in Iraq, Ministry of Agriculture, Baghdad, Iraq, P. 306.

Table 9.7 Classification of Irrigated Land by Salinity

Salt content mmhos/cm	Degree of Salinity: None-saline Lands 0-4	Slightly Saline lands 4-8	Moderately Saline lands 8-16	Highly Saline lands over 16	Total
Area with irrigation net work : mill. donums	4.2	2.4	2.4	2.6	11.6*
% of area with irrigation net-work	36	21	21	22	100

* The total irrigated area with network is less than in Table 4.5

Source : Ministry of Irrigation & Selkhozpromexport (USSR)(1975) : General Scheme of Water Resources and Land Development in Iraq, Baghdad, Iraq, Table IV 2.2.4, p.128.

distribution and drainage to undetermined future dates.[32] Sometimes drainage facilities are never properly established and this is a major reason for waterlogging and soil salinity build-up in Iraq.[33] The most obvious example is the Dujalih project, started in 1946 and by 1953 already reported to have worsening soil salinity conditions in the project area.[34]

Irrigation and drainage projects require both private and government capital and initiative. So far the government has not been involved in establishing on-farm drainage facilities.[35] On the other hand, lack of security of tenure (see pages 161-65), lack of capital (see pages 219-29), and above all the lack of experience of the benefits of good field drainage have prevented farmers from establishing field drainage systems.

Given this, one might suggest that the government should establish a comprehensive drainage policy in Iraq at all scales down to field level, even if it has to tax farmers in order to cover at least part of the construction cost.

3. Construction of a drainage system must be followed by adequate maintenance. Unfortunately, through inadequate maintenance those drainage systems already installed in Iraq are not working to full capacity.[36] The annual maintenance cost can, of course, be very high. For example, in the Great Mussayb Project, it is estimated that the annual maintenance cost of the drainage system is I.D. 600,000 for an area of only 837 sq.km.[37]

4. It is very common in Iraq to find that farmers release excessive irrigation water from cropped land to fallow fields where the water evaporates leaving salts concentrated on the topsoil.

5. The physical conditions, such as high temperatures in summer, high evaporation, soil permeability and topography all have to be properly evaluated. Some physical conditions can be improved, such as soil permeability and irrigability, for example, by levelling the land and improving soil conditions by using green manure and chemical fertilizers to improve soil conditions.[38]

To understand the effect of soil salinity on agricultural production, one has to look at the yields of some crops in relation to soil salinity. Table 9.8 shows the results of field experiments on the effect of soil salinity. Obviously, desalinization will result in improvement in yield, increase production and improve farmers' incomes. Achieving this will depend on establishing good drainage systems and improving farming practice.

9.7 The Cost of Land Reclamation

The problems of soil salinity and water logging will become worse if the government does not take more serious steps to stop it by first, construction of drainage systems, including on-field drainage, secondly leaching the affected areas, thirdly, controlling irrigation water, and fourthly, improving farming practice. Recent estimates of land reclamation costs in Iraq are not available. But it was estimated a decade ago that the total cost of land reclamation, including leaching, the installation of field drainage systems, main drainage system, pumping stations, etc., would cost I.D.80-150 per donum at 1970 prices, and without any doubt this cost has increased in recent years.[39] This implies that the minimal total cost of needed land reclamation in Iraq is between I.D. 1,000 and 1,875 million at 1970 prices. This estimate is based on two assumptions: first that the total utilized land in the

Table 9.8 Decrease in Yields of Crops with Rising Soil Salinity

(in per cent)

Crops	Soil Salinity mmhos/cm.					
	0 - 4	4 - 6	6 - 10	10 - 14	14 - 18	18 - 22
Wheat	10%	30%	-	-	-	-
Barley	0	1%	27%	45%	62%	75%
Berseen (clover)	0	0	26%	48%	55%	65%

Source : As in Table 9.7, Table IV. 2.2.7, p.130.

irrigated area is 12.5 million donums and, secondly, that all the utilized land in the irrigated areas has soil salinity problems. This at least indicates the order of magnitude of required expenditure.

It may be asked whether there is socio-economic justification for the government to start such expensive programmes, and the answer must be, yes. In spite of rural-urban migration there remains a very large number of people dependent on agriculture, both socially and economically. Improving land productivity probably could mean that Iraq could secure enough food through local production, and this point is very important for the country's stability and for the stability of rural societies. Land reclamation programmes depend, however, not only on financial resources, but also on other economic and technical factors. (The government, however, should also simultaneously develop agriculture in the rainfed area).

9.8 Actual Water Utilization

Planning for future water utilization, especially in agriculture, will depend in general on two factors: first, how much water is actually being used and secondly, what water resources are or will be available in the country. In this section, water utilization in Iraq will be discussed under two sectoral headings - non-agricultural and agricultural respectively.

9.8.1 Actual Water Utilization in the Non-Agricultural Sectors

In addition to irrigation, water is needed for other purposes such as domestic use, industry, livestock and river navigation. Data on water consumption and requirements for each of these sectors unfortunately are not available in detail. The only data available is the amount of potable water produced in municipal areas. Table 9.9 shows that potable water produced in municipal areas increased from 320.8 million cubic metres in 1972 to 454.27 million cubic metres in 1977, an increase of 41.6 per cent in five years. This potable water is intended for domestic and industrial purposes. Nonetheless, the average consumption in 1977 of 59 cubic metres per person per year is relatively low compared with the average consumption of 91.25 and 80.3 cubic metres per person per annum in Cairo and Alexandria respectively.

In rural areas, water can be abstracted directly from rivers by the rural population and livestock. Adding this consumption to the potable water produced in the municipal areas gives the total non-agricultural water withdrawal from rivers. To estimate the total water withdrawal from rivers in Iraq in 1977, the following assumptions are made: first, that the per capita water consumption in rural areas is half that in urban areas because of differences in socio-economic conditions. Secondly, that the estimate made by Al-Kashab in 1958 of livestock water consumption at 125 million cubic metres, since there is no significant increase in the number of livestock in the country, is still valid.[40] Table 9.10 shows the estimated water withdrawal from rivers for these purposes in 1977: only about 1 per cent of the total annual flow of the Tigris and Euphrates. Non-agricultural consumption clearly has no significant effect on water availability for irrigation. As for non-consumptive uses, such as navigation and hydro-electric generation, there is no data available for analysis - the aggregate volumetric demands are relatively small.

9.8.2 Actual Irrigation Water Requirements

To assess the present irrigation demand for water we must know the actual irrigated area, and rate of application in terms both of gross and net irrigation duty.

Earlier we estimated the annual cropped area in the irrigated

Table 9.9 Potable Water Production in Municipal Areas

	Fresh water million m^3
1972	320.8
1973	346.6
1974	367.0
1975	412.9
1976	416.36
1977	454.27

Source : Ministry of Planning : Statistical Abstracts, 1977. Baghdad, Iraq.

Table 9.10 Estimated Water Withdrawal from the Rivers in 1977

	Water in Million m^3	%
Domestic		
Potable water[1]	454.27	56.3
Direct Consumption[2]	227.14	28.2
Livestock[3]	125.00	15.5
	806.41	100

Sources : 1. Table 9.9

2. Half of the Potable Water Produced in 1977 in Municipal areas.
3. Al-Khashab, W.H. (1958) : The Water Budget of The Tigris and Euphrates Basin, Research Paper No.54, Dept. of Geography, University of Chigago, p.67.

region at 6.75 million donums (see page 121) very similar to the Russian team's estimate of 6.27 million donums. For the purpose of estimating the total water used for irrigation, the Russian figures will be used.

In Iraq, under present conditions, it is impossible to determine the actual amount of water demand by irrigation. No overall data is available on the components of this demand,i.e. actual amounts of water withdrawal at the heads of the main canals, evapotranspiration by crops, water losses in the irrigation network, water discharge for maintaining necessary command water levels in canals, transit disposal of flood water, surface water disposal during irrigations and other irrigation water losses,etc. Here, therefore, we have to utilise the latest study which was carried out by a Russian team and published in 1975.[41]

9.9 Net Irrigation Duty

Net irrigation duty is defined as the amount of water consumed by plants. Determining, however, net irrigation duty for each crop depends on many factors such as temperature, evaporation, wind, soil moisture, precipitation and other factors.

The research data available in Iraq is not sufficient for a direct assessment of water demands of plants, therefore water consumption of agricultural crops was defined by indirect methods based on determination of potential evapotranspiration.[42] When defining these duties the water requirement for presowing irrigation was also taken into account.

Table 9.11 shows the irrigation duties of main crops for different climatic regions in Iraq. It is clear from this table that irrigation duties are at the highest level in the Southern region for winter and summer crops. This is mainly due to high aridity and temperature, especially in the summer season. On the other hand, in the Northern

Table 9.11 Net Irrigation Duties* for Climatic Zones of the Country

Principal crops	Zones					
	Northern		Central		Southern	
	mm.	m^3/donum	mm.	m^3/donum	mm.	m^3/donum
Winter crops						
Wheat, Barley	320	800	430	1,070	520	1,300
Linseed, sunflower	340	850	410	1,025	-	-
Legumes (peas,beans,lentils)	220	550	300	750	370	920
Berseen (Clover)	400	1,000	540	1,500	590	1,475
Sugar beet	670	1,670	840	2,100	850	2,125
Potato (late)	460	1,150	490	1,220	520	1,300
Onion (dry)	740	1,850	900	2,250	900	2,250
Other vegetables	320	800	370	1,925	490	1,220
Summer crops						
Cotton	790	1,970	1,080	2,700	1,170	3,000
Sesame	730	1,825	790	1,975	800	2,000
Rice**	1,850	4,630	1,970	4,925	2,145	5,363
Tobacco	620	1,550	-	-	-	-
Legumes(green gram cow peas)	940	2,350	1,240	3,100	1,240	3,100
Vegetables (tomatoes,okra,water melons, egg plants,etc)	850	2,070	1,130	2,825	1,210	3,025
Maize, sorghum	780	1,950	920	2,300	970	2,430
Perennials						
Orchard, palm-trees	920	2,300	1,480	3,700	1,730	4,320
Alfalfa	1,280	3,200	1,820	4,550	1,920	4,800
Sugar cane	-	-	-	-	1,880	4,700

* Irrigation duties (crop duties) are defined mainly from Blaney-Criddle formula with monthly crop coefficient "K" corrected on the basis of data of experiments carried out in Iraq.

** For rice and perennial crops the duties are accepted from calculations conducted by Dr.Said Al-Jazaleri in his thesis. Net irrigation requirements for rice include water used for soil saturation before sowing, for creation water layer in checks for flowage and outflow to drains.

Source : As in Table 9.7, Table V.2.3-1, p.140.

region, we find the opposite conditions: relatively low temperature and more precipitation which helps to reduce potential evapotranspiration and consequently low irrigation duties for all crops.

9.10 Gross Irrigation Duty

Water discharge additional to net irrigation duties is delivered to the irrigated field to compensate inevitable water losses by evaporation and infiltration from channels and fields during irrigation, as well as to provide volumes of water required to keep a stable water-salt regime in soils and to prevent salinization.

Table 9.12 shows the gross irrigation duties for the principal crops according to climatic regions and river basins. Again, this table shows the gross irrigation duties at the highest level, in the Southern region for both winter and summer crops.

Depending on the character of irrigated land utilization, cropping pattern, crop rotation by season, as well as the intensity of utilization of the irrigated lands, the weighed gross irrigation duties were calculated for winter and summer crops for different parts of river basins. Table 9.13 shows the results of such calculations.

Thus, in the Euphrates River Basin the mean annual irrigation requirements per hectare of the annually irrigated area for different parts of the river are shown in Table 9.13. The weighed mean gross irrigation duties range between 12.5 - 13.0 and 11.8 - 25.4 thousand cubic metres for the Central and Southern zones of the Euphrates rivers respectively.

The value of the weighed mean irrigation duties for the Northern region of the Tigris river basin is between 9.4 - 15.2 thousand cubic metres per hectare; in the Central region it is estimated between

12.2 - 12.3 thousand cubic metres per hectare; and in the Southern region it ranges between 12.0 - 19.6 thousand cubic metres per hectare.

In the Shatt Al-Arab river basin where intensity of irrigation and land utilization is supposed to be high, water requirements per hectare is estimated at 21.4 thousand cubic metres.

As a whole, the mean annual irrigation duties per hectare of the annually irrigated area in the Euphrates river basin are some 14.2 thousand cubic metres, while in the Tigris river basin about 12.9 thousand cubic metres per hectare. As for the whole country, the weighted gross irrigation duty is estimated at 13.5 thousand cubic metres per hectare (see Table 9.13).

9.11 Actual Water Requirements for Irrigation

The results of the calculation for determining gross water requirements for irrigation by river basins in Iraq for the average irrigated land of 1968/72 was 22,527 million cubic metres. Table 9.14 shows the distribution of irrigation water requirements according to the river basins.

When determining gross water requirements for irrigation, water discharge for maintaining necessary command water level in the rivers and canals, transit discharge, etc. was not taken into consideration. These were estimated at approximately 6 milliard cubic metres, nearly 27 per cent of the actual water required for irrigation. Hence, the gross water requirements for irrigation, taking account of additional water discharge, would be about 29 milliard cubic metres of water.

If we assume, therefore, that there was no actual increase in the total irrigated area between 1972 and 1977, the total water required for different purposes are already almost half of the total surface water

Table (9.12) Gross Irrigation Duties for Principal Crops by Climatic Zone in River Basins

Principal Crops	Euphrates River Basin				Tigris River Basin*					
	Central Zone		Southern Zone		Northern Zone		Central Zone		Southern Zone	
	mm.	m³/donum	mm.	m³/donum	mm.	m³/donum	mm.	m³/donum	mm.	m³/donum
Winter Crops										
Wheat, Barley	770	1,920	930	2,330	600	1,500	810	2,020	980	2,450
Linseed	730	1,820	-	-	640	1,600	770	1,920	-	-
Legumes (peas,beans,lentils, etc)	540	1,350	660	1,650	410	1,025	570	1,420	700	1,750
Bereseem (clover)	970	2,420	1,070	2,970	760	1,900	1,020	2,550	1,110	2,770
Sugar Beet	1,500	3,750	1,550	3,870	1,260	3,150	1,580	3,950	1,600	4,000
Potato (late)	870	2,190	930	2,330	870	2,175	920	2,300	980	2,450
Onion (dry)	1,610	4,030	1,610	4,030	1,390	3,475	1,700	4,250	1,700	4,250
Other vegetables	660	1,650	870	2,190	660	1,500	700	1,750	920	2,300
Summer crops										
Cotton	1,960	4,900	2,130	5,320	1,490	3,720	2,040	5,100	2,210	5,520
Sesame	1,430	3,600	1,450	3,640	1,380	3,450	1,490	3,720	1,510	3,770
Rice	3,580	8,950	3,900	9,750	3,490	8,730	3,720	9,300	4,040	10,100
Legumes,(green gram, cow peas)	2,260	5,650	2,250	5,640	1,770	4,420	2,340	5,850	2,340	5,850
Vegetables (water melons,tomatoes,okra, egg plants, peppers, etc.)	2,050	5,150	2,200	5,500	1,570	3,920	2,130	5,320	2,280	5,700
Maize, sorghum,etc.	1,670	4,180	1,760	4,400	1,470	3,680	1,740	4,350	1,830	4,570
Tobacco	-	-	-	-	1,170	2,930	-	-	-	-
Perennials										
Orchards, palm-trees	2,510	6,280	2,930	7,330	1,740	4,350	2,790	6,970	3,260	8,150
Alfalfa	3,080	7,710	3,250	8,150	2,410	6,020	3,430	8,570	3,620	9,050
Sugar Cane	-	-	-	-	-	-	-	-	3,550	8,870

* Including Shatt Al-Arab

Source : As in Table 9.7, Table IV.2.3-4, p.146 and Table IV.2.3-5, p.147.

Table 9.13 Weighed Means Gross Irrigation Duties by Climatic Zones of River Basins

Groups	Weighted Mean Gross Irrigation Duties Thous.m^3/ha.			
	Northern Zone	Central Zone	Southern Zone	Average for the country
	Euphrates River Basin			
Winter crops	-	6.8 - 8.3	8.8 - 9.7	8.3
Summer crops	-	16.8 - 20.4	23.8 - 34.5	23.5
Perennials	-	23.8 - 27.8	28.1 - 30.2	27.6
Mean annual duty by design units of the basin	-	12.5 - 13.0	11.8 - 25.4	14.2
	Tigris River Basin			
Winter crops	6 - 7.4	7.0 - 7.3	8.1 - 9.5	6.8
Summer crops	14 - 17.5	14.6- 17.1	17.1 - 34.4	20.1
Perennials	14.6 - 24.4	23.8- 24.0	23.8 - 29.0	25.5
Mean annual duty by design units of the basin	9.4 - 15.2	12.2- 12.3	12.0 - 19.6	12.9
	Shatt Al-Arab River Basin			
Winter crops	-	-	8.2	8.7
Summer crops	-	-	24.2	26.0
Perennials	-	-	28.1 - 29.3	30.3
Mean annual duty by design units of the basin	-	-	20.8 - 22.2	21.4
Mean annual duty by design units of the river basins	9.0 - 15.0	12.5 - 13.0	12.0 - 25.0	13.5

Note : Duties are given for annually irrigated area excluding water requirements for heavy leaching.

Source : as in Table 9.7, Table v.2, 6.7, p.114.

Table 9.14 Gross Water Requirements for Irrigation by River Basins

River Basins	Average and Cropping Patterns, Average for 5 years (1968 - 1972)		
	Area of irrigated land 000 donums	Water requirements for irrigation mill. m^3	Gross irrigation duties thousand m^3/ donum
Euphrates R.Basin Total	2359	8848	3.8
including Upstream from Hindiya Barrage.	1702	5730	3.4
From Hindiya Barrage to Qurna	650	3118	4.8
Tigris R.Basin Total	3761	12805	3.4
including Upstream from Samarra Barrage excluding tributaries	480	1631	3.4
From Samarra Barrage to Kut Barrage	1535	5029	3.3
From Kut Barrage to Qurna	358	1825	5.1
Tributaries			
Greater Zab River	85	310	3.6
Lesser Zab River	240	1037	4.3
Adim R.	90	184	2.0
Daila R.	974	2789	2.9
Shatt Al-Arab R.	107	874	8.2
Total for River Basins in Iraq	6224	22527	3.6

Source : As in Table 9.7, Table IV, 2.3.7, pp.149-50.

available in the country under normal conditions (no further control in the upper stream of the two rivers), and this is a conservative estimate.

9.12 Future Water Resources Available within Iraqi Territories

The second factor which affects future water utilization is the availability of water, especially for agricultural purposes. It was noted earlier that the most important part of water resources in Iraq is surface water supplied by the two rivers, the Tigris and Euphrates. The sources of water of these two rivers are mainly in Turkey which supplies 70 per cent of water. Iraq and Iran supply 23 and 7 per cent of water respectively.[43] Turkey's contribution comes through the main stream of the rivers, whilst Iraq and Iran contribute mainly through the tributaries of the Tigris river. The average annual discharge of both rivers in Iraq was 63 milliard cubic metres between 1960 and 1976.

Recently there have been many development projects in Turkey and Syria to utilize water resources of the Euphrates. The Keban and Elazig dams on the Euphrates in Turkey, primarily to produce electricity but also with irrigation potential, will require a large amount of water storage. In Syria the Tabaka dam also will hold a large amount of water for irrigation as well as generating electricity.

Owing to these developments, the annual water discharge of the Euphrates river fell below the normal annual discharge between 1973 and 1976, and it has fluctuated abnormally ever since. For example, the annual water discharge of the Euphrates river dropped to nearly 9 milliard cubic metres of water in 1974 and 1975, which was the lowest discharge recorded in the history of the river in Iraq. The main reason for that was the filling of the Keban and Tabaka dams in Turkey and Syria respectively.

Although tripartite negotiation between Iraq, Syria and Turkey has been in progress for some considerable time, no formal agreement has yet been reached on the allocation of water to Iraq, whose original demand was for 18 milliard cubic metres per annum, more recently reduced to 13 milliard cubic metres per annum.[44]

In the case of the Tigris there are no immediate plans to utilize its water in Turkey, but there are many plans to utilize the water resources of the Tigris tributaries which rise in Iran, i.e. the Diala, the Greater and Smaller Zab rivers. Consequently, this probably will affect the annual flow of the Tigris river itself, as well as affecting the irrigated areas which depend on direct irrigation from these tributaries. In fact, it has been reported that several cultivated areas and towns near the Iranian border have been affected because of utilization of water in the upper stream of the River Diala in Iran for irrigation purposes.[45]

It is clear from the previous discussion that prospects of securing enough water in Iraq through the Euphrates and Tigris rivers will depend very much on cooperation between the countries concerned, namely, Turkey and Syria and, ideally, Iran. There are many international agreements for water utilization, and the agreement between Egypt and Sudan is a good example.[46] Many people have expected such conflict, e.g. Sir W. Willcocks and the IBRD. [47,48] At this stage it is essential for the Iraqi government to exploit underground water resources and increase water storage capacity in order to minimize the risk of water shortage in the future. In the case of irrigation, water must be used far more efficiently than at present.

9.13 The Possible Increase in Irrigated Area

Having known how much water is actually used for irrigation, one can go further and estimate how much the area of irrigated land can be expanded in Iraq in relation to the water resources available in the country. The future expansion prospects for irrigated land will be determined by the following factors.

1. It is necessary to develop vast areas of saline land for agricultural use. Here, drainage and leaching are the most effective measures against salinization. In the short term, Iraq will have to apply heavy leaching which requires very high gross water duty.

2. Water losses in the canals and fields could be decreased as a result of the irrigation system's reconstruction and levelling as well as through more intensive land cultivation and better farming practice. It has been estimated that the average efficiency of irrigation coefficient for the irrigation systems of Iraq varies from 0.56 to 0.63, taking into account water losses and water requirements for a leaching regime on irrigated land in different parts of the Tigris and Euphrates river basins. The value of the irrigation efficiency coefficient for the country as a whole was determined as 0.62.[49] In other words, with improvement in water and farm management, the current irrigation efficiency coefficient could be improved. According to Russian experimental data for similar conditions, a reduction of the net irrigated duty by 10-15 per cent will probably take place due to the fact that plants can partially use desalinized ground water.[50]

3. Improved utilization of the irrigated land during all seasons and more intensive cultivation are possible. Table 9.15 shows the intensity potential of irrigated land cultivation by regions as suggested by the Russian plan.

Bearing in mind all these assumptions, the Russian team drew up a plan to expand irrigated area up to 1995 in Iraq (see Tables 4.6 and 9.15). The aim is to increase the net irrigated utilized area from 6.27 million donums to 13.5 million donums in 1995 annually. The estimated total annual water requirements for this plan is 47 milliard cubic metres, and Table 9.16 shows the monthly and annual water requirements.

A previous plan was proposed by KTAM in 1952 which suggested that 13 million donums can be brought under intensive cultivation in the irrigated area in Iraq, the annual water requirements for this plan being 47.1 milliard cubic metres.(51) The KTAM report then suggested that water resources were assured for such an increase, especially if more water control measures were implemented. It estimated that the water discharges during the dry years would be 17.2 and 32.5 milliard cubic metres in both the Euphrates and Tigris rivers respectively, i.e. at least 49.7 milliard cubic metres of water would be available for irrigation.

The question of whether such plans are realistically feasible depends very much on the balance of the assumptions noted earlier, i.e. water availability and improving irrigation and farming systems.

Considering, however, the previous discussion on factors affecting farm and water management, such as the type of investment, institutional charges, extension services, new technology and mechanization, and how much actually has been achieved during the last 25 years to improve farming systems, it would seem very difficult to achieve the progress demanded by the irrigation area expansion plans unless the government increases agricultural investment, not only in capital but also in skilled manpower, management, etc., to a substantial level in all the input factors.

Table (9.15) Intensity of Irrigation Areas Utilization by 1995

River Basin	Winter - 100%			Summer - 100%			Year (Winter & Summer) 200%	
	Winter crops	Perennials crops	Fallow and lay lands	Summer crops	Perennials crops	Fallow and lay lands	Crops and Plantat-ions	Fallow and lay lands
Euphrates Rivers	56	8	36	16	8	76	88	112
Tigris River	68	10	22	22	10	68	110	90
Shatt Al-Arab River	60	36	4	24	36	40	156	44
Total for Iraq	64	10	26	20	10	70	104	96

Source : As in Table 9.7, Table V.2.6 4, p.109.

Table (9.16) Annual and Monthly Mean Requirements for Irrigation for the Long-Term Period of Development (up to 1995)

Part of river basin	Net irrigation areas thousand donums / hectare	Area of Annually irrigated land in % to net irrigation area	Monthly water requirements mill.m^3 / % of annual: Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual water requirements mil.m^3	Weighed mean gross irrigation duty* thus m^3/hect. / m^3/don.
Euphrates River Basin																
Total for the river basin	5,627 / 1,407	74.8	553 / 3.7	942 / 6.3	1,519 / 10.1	1,285 / 8.5	988 / 6.6	1,720 / 11.4	1,941 / 12.9	1,553 / 10.3	1,587 / 10.5	1,373 / 9.1	890 / 5.9	714 / 4.7	15,065 / 100	14.3 / 3.6
including :																
Upstream of Hindiyah Barr.	3,811 / 953	76.8	354	644	1,049	912	646	982	1,109	815	865	970	590	454	9,390 / 100	12.8 / 3.2
Downstream of Hindiyah Barr.	1,816 / 454	70.7	199	298	470	373	342	738	832	738	722	403	300	260	5,675 / 100	17.6 / 4.4
Tigris River Basin																
Total for the basin	9,738 / 2,435	91.1	1,005 / 3.4	1,726 / 5.9	2,789 / 9.5	2,665 / 9.1	2,246 / 7.6	3,649 / 12.4	3,825 / 13.0	3,080 / 10.5	2,667 / 9.1	2,618 / 8.9	1,799 / 6.1	1,328 / 4.5	29,397 / 100	13.3 / 3.3
including :																
Tigris R.Upstream of Sammarra Barr.(with tributaries)	2,836 / 709	100	87 / 1.2	167 / 2.3	526 / 7.2	706 / 9.6	765 / 10.4	1,154 / 15.7	1,103 / 15.0	981 / 13.3	631 / 8.6	697 / 9.5	354 / 4.8	183 / 2.5	7,354 / 100	10.4 / 2.5
Diala R.Basin	1,500 / 375	100	124 / 2.8	304 / 6.8	492 / 11.0	531 / 11.9	354 / 7.9	506 / 11.3	558 / 12.5	425 / 9.5	269 / 6.1	464 / 10.4	252 / 5.6	186 / 4.1	4,465 / 100	11.9 / 3.0
Tigris R.from Sammarra Barr.to Kut Barrage (with Adham & Diala Rivers)	5,557 / 1,389	89.7	673 / 4.1	1,238 / 7.4	1,932 / 11.6	1,690 / 10.2	1,141 / 6.9	1,759 / 10.5	1,896 / 11.4	1,380 / 8.3	1,320 / 8.0	1,608 / 9.7	1,107 / 6.7	859 / 5.2	16,603 / 100	13.4 / 3.1
Tigris R.from Kut Barr. to Qurna	1,345 / 336	78.3	245 / 4.5	322 / 5.9	330 / 6.1	269 / 4.9	340 / 6.3	736 / 13.5	826 / 15.2	719 / 13.2	715 / 13.1	313 / 5.8	339 / 6.2	286 / 5.3	5,440 / 100	20.7 / 5.2
Shatt Al-Arab																
Total for the Basin	423 / 106	100	80 / 3.4	119 / 5.0	160 / 6.7	161 / 6.7	223 / 9.4	332 / 14.0	345 / 14.5	275 / 11.6	276 / 11.6	174 / 7.3	133 / 5.6	95 / 4.1	2,373 / 100	22.4 / 5.6
Total for Iraq	15,788 / 3,947	85.5	1,638 / 3.5	2,787 / 6.0	4,468 / 9.5	4,111 / 8.8	3,457 / 7.4	5,701 / 12.2	6,111 / 13.0	4,908 / 10.5	4,530 / 9.7	4,165 / 8.9	2,822 / 6.0	2,137 / 4.5	46,835 / 100	13.9 / 3.5

* Gross duty is given per one ha. of area annually irrigated lands with account of water requirements for heavy leaching.
Source : As in Table 9.7, Table V.2, 6.7, pp.121-123.

Water availability is the other serious problem, and this depends partly on improving the efficiency of irrigation systems and water control projects in the country and partly on future utilization of water resources in the upper stream of both rivers, the Euphrates and Tigris, by Turkey and Syria. So far there is no international agreement between the countries concerned to share water resources of the Euphrates river despite the reduction of the Iraqi claim from 18 to 13 milliard cubic metres of the annual discharge.[52] Assuming, however, that Iraq will receive the claimed 13 milliard cubic metres of water from the Euphrates river, this will bring the approximate total surface water available in the country to an average of 45.5 milliard cubic metres of water from the two rivers (the average annual discharge of the Tigris river was 32.5 milliard cubic metres between 1960 and 1976). This amount is less than the required water for both major plans quoted above and casts considerable doubt on any plan for expansion of the irrigated area to such a level.

There are, however, other possibilities for improving irrigated agricultural production and productivity, mainly based on intensification rather than expansion, and these involve:

1. Concentrating on the less saline land where less leaching water is required.

2. Selecting crops with lower water duty requirements and avoiding as far as possible crops with high requirements such as sugar cane and sugar beet, especially during land reclamation periods.

3. The cultivation of salt resistance crops.

4. Government action to expand water storage capacity to even out fluctuations in natural supply over time, and it seems this point has recently been considered (see Tables 9.2 and 9.3).

5. The study of means of minimizing water loss through open water evaporation from dams and reservoirs. The actual average rate of open water evaporation is estimated at 2.25 m. per annum, and this is a very serious loss.

6. Planned development, through water supplementation of precipitation, of land where precipitation is not itself sufficient for successful cultivation in winter. Water requirements in these marginal lands would be less than elsewhere.

7. Studying the possibilities of utilizing recycled drainage water either directly or by mixing it with fresh water. In Egypt, for example, drainage water has been used in land reclamation projects as well as in cultivation since 1973 and it is reported that at least 5 milliard m^3 of drainage water is so used annually.[(53)] This could have a very significant impact.

8. Government action to exploit underground water for agricultural and non-agricultural purposes, especially in the rainfed area in which summer cultivation is impossible without irrigation.

9. Government action to use recycled effluent water for agricultural and industrial purposes.

10. **Assessment of suitable irrigation techniques for particular farming requirements.**

9.14 <u>Conclusion and Final Remarks</u>

Without any doubt, water is the most important fact, not only to maintain agricultural production but also to improve agricultural productivity if it is applied appropriately together with other new input factors.

Agriculture in Iraq depends on rainfall in the Northern region and irrigation in the Central and Southern regions (see page 427). Surface water is the major source of water for irrigation, which is provided by the two rivers, the Euphrates and Tigris. The average annual discharge of these two rivers is 63 milliard cubic metres. Although Iraq is extremely dependent on these river flows, it is a riparian state without control of headwater sources.

Whilst the rivers supply high quality water for irrigation, there is also heavy sedimentation. The non-coincidence in time of the largest flows and peak irrigation demands the necessity of expanding water storage capacity within the country. This to some extent is made more difficult by the heavy sediment loads.

Unlike the rainfed area which is free from soil salinity and water logging, the irrigated areas have been affected very badly by these two problems which are caused by human and physical factors. Human errors include the misuse of irrigation water and inadequate installation of drainage networks. The inescapable physical factors include soils which rapidly deteriorate in texture, permeability and fertility under poor management, and the direct and indirect effects (through soil formation) of aridity and seasonally high temperatures. We have noted in particular how land productivity has declined as the result of increasing soil salinity and water logging.

The reported feasibility of doubling the irrigated area is critically conditional on water resource availability and improved farm and water management. We have seen that current water usage is already estimated at about half of the currently available water resources, and there is no certainty of securing for the future even this, let alone additional water, because of the absence of international water-sharing agreements with Turkey and Syria.

The prospect of rapidly improving water and farm management is not good either. Earlier evaluation of the effectiveness of, for example, mechanization, extension services and new inputs reveals how difficult it will be quickly to improve agricultural water management to a significant level. Thus increasing the net utilized irrigated area to 13.5 million donums seems rather a doubtful prospect in the short term.

We have, up to this point, examined the main aspects of relationship between agricultural productivity and several sets of input factors, investment, institutional organization, new technology, etc. Here, we have reached the stage at which we can, as far as possible, isolate for analysis the other key factors which affect agricultural productivity, i.e. weather and climate. As noted in the introduction, it is only by first considering the effects of the non-climatic sets of factors that we can appreciate the potential significance to production and productivity of weather and climate factors.

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